DOCUMENT RESUME

ED 197 951 SE 033 926

TITLE	Core Algebra.
INSTITUTION	Hawaii Univ., Honolulu. Coll. of Education.; Hawaii Univ., Honolulu. Curriculum Research and Development Group.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.; Hawaii State Dept. of Education, Hilo.
PUB DATE	79
NOTE	149p.
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	*Algebra; *Instructional Materials; *Lesson Plans; Mathematics Curriculum; *Mathematics Instruction; Mathematics Materials; Problem Solving; Secondary Education; *Secondary School Mathematics; *Teaching Guides; Teaching Methods; Tests; Worksheets

ABSTRACT

This document focuses on Core Algebra, a course offered in the Hawaii State Department of Education's "Mathematics Program Guide." This algebra option is designed to be less theoretical and more application-oriented than Algebra IA and IB. The text opens with a list of twenty minimum learner objectives of the course. The next section presents an analysis of some of the text materials currently available that address these objectives. These are categorized into four types. An example of each type is listed and given a one-page review, with all four texts analyzed in a table. Four suggested supplementary materials are compared in a second table and are briefly reviewed. The bulk of this document is a sample Core Algebra course, based on the "Basic Algebra" textbook published by Houghton Mifflin Company. A course outline, suggested time schedule, vocabulary, comments on instructional strategies, and suggested assignments are provided. Student worksheets, quizzes, and tests are also included, with instructional objectives given for lessons requiring supplementary worksheets. (MP)

****

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

****

ED197951

U S DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
P. Izumo

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SE 033 926

ACKNOWLEDGMENTS

The Department of Education acknowledges the Curriculum Research and Development Group of the University of Hawaii, and Dr. Nancy C. Whitman, Project Administrator, for the development of this instructional module. Gratitude is extended to the teachers of Castle High School who participated in the pilot testing of the module. Appreciation is also extended to the district mathematics coordinators who facilitated the conduct of the pilot test.

Developed by

Curriculum Research and Development Group
University of Hawaii
for the
Department of Education

Funded by
Title IV-C, Elementary and Secondary Act

1979

Introduction

Core Algebra is a course offered in the Option Y sequence of the high school mathematics program described in the Hawaii State Department of Education's Mathematics Program Guide. According to the guide, the course is an algebra option which is less theoretical than that for Algebra IA and Algebra IB. It is also more application-oriented. As such, objectives for this course tend to emphasize those fundamentals of algebra that are most needed for the applications-oriented courses in the Option Y sequence.

The Mathematics Program Guide lists twenty learner objectives for the course. These objectives indicate the minimum course content for a Core Algebra course. They are listed below:

1) Adds and subtracts polynomials and multiplies two binomials.

2) Performs the four basic operations with simple rational expressions.

3) Evaluates algebraic expressions and solves for the unknown in formulas with three variables given two of the variables.

4) Uses the symbolism and technical terms of algebra.

5) Gives examples and applies properties of the real number system such as the distributive and order properties.

6) Translates algebraic statements into verbal statements and conversely.

7) Uses tables to compare quantities represented by algebraic expressions.

8) For a real world situation, prepares and uses a table to discover a relationship or to decide the best course of action.

9) Writes an algebraic expression to represent a verbal expression.

10) Solves equations of the form $ax + b = c$ or $ax + b = cx + d$.

11) Given a verbal problem, writes an appropriate equation, solves the equation, interprets the problem in terms of the problem setting.

JAN 26 1981

12) Graphs points from ordered pairs and finds ordered pairs for points.

13) Graphs linear functions by making a table of ordered pairs and graphing them.

14) Interprets a graph by stating what it shows and makes a table from it.

15) Compares the graph of two linear functions.

16) Uses the graphs of $y = ax + b$ to solve a variety of written and oral problems.

17) Applies formulas that arise from real-world situations.

18) Investigates how formulas for perimeter, area, and volume of geometric figures are derived.

19) For a given situation, prepares a table or graph to discover a formula, finds a maximum or minimum value, or decides the best course of action.

20) Interprets graph of the forms: $a = xy$ and $y = ax^2$.

Materials which address these objectives are currently available. Part I of this module presents an analysis of some of these materials and Part II offers a sample course, using one of the materials analyzed.

Part I: Materials Analysis

In the review and analysis of currently available materials which speak to the objectives of the Core Algebra course, several types of text materials are apparent. These are:

Type 1: Texts that cover the fundamental (as compared to the standard) topics of a traditional algebra course with some attention to applications.

Type 2: Texts that integrate the major content areas of secondary school mathematics. In this situation algebra, geometry, and statistics are introduced together in a course of study instead of three sequential separate courses of study. Hence, to cover the objectives of Core Algebra, one would need several portions of texts. In addition, these texts do focus on applications.

Type 3: Texts that deliberately omit some of the topics covered in a traditional algebra course. In its place are those topics that are more related to the area of applications. Attention to applications in these texts are more than ordinary.

Type 4: Texts that introduce many of the algebra topics in a traditional algebra course through the discussion of applications.

Teachers using any of these types of texts will find that most, if not all, of the content objectives of the Core Algebra course will be covered. An analysis of algebra texts that fall into one of the four categories are displayed in Table 1. A check (✓) has been placed next to an objective if coverage is provided.

In addition to coverage of the objectives, considerations like the following need to be checked: the appropriateness of the materials in terms of sequencing of topics, reading level, and use of technical language; the emphasis on problem-solving strategies and communication skills; the inclusion of practical applications; the availability of sufficient number of exercises; and the availability of a teacher's guide and supplementary materials. A description of the texts mentioned in Table 1 relative to these considerations follows the table.

Should any text be lacking in terms of addressing the objectives of the Core Algebra course, supplementary materials could be used. An analysis of possible supplementary materials that could be used are shown in Table 2. This is followed by a brief description of the materials suggested.

7

Table 1

LEARNER OBJECTIVES	Type 1: Basic Algebra	Type 2: SMP books	Type 3: Algebra via Applications	Type 4: Algebra One
ALGEBRAIC EXPRESSIONS				
• Operations with polynomials	✓		✓	✓
• Operations with rational expressions	✓		✓	✓
• Evaluating and solving algebraic expressions	✓	✓	✓	✓
LANGUAGE OF ALGEBRA				
• Symbols and technical terms	✓		✓	✓
• Properties of number systems	✓	✓	✓	✓
• Translating algebraic statements			✓	✓
TABULAR RELATIONSHIP				
• Comparing tables		✓	✓	✓
• Preparation and uses of tables	✓	✓	✓	✓
EQUATIONS				
• Writing algebraic expressions	✓		✓	✓
• Linear equations	✓	✓	✓	✓
• Word problems	✓		✓	✓
GRAPHS LINEAR FUNCTIONS				
• Ordered pairs and points	✓	✓	✓	✓
• Graphing linear functions	✓	✓	✓	✓
• Interpreting graphs of linear functions	✓	✓	✓	✓
• Comparison of two linear functions	✓	✓	✓	✓
• Problem-solving by graphs		✓	✓	✓
APPLICATIONS OF FORMULAS				
• Applications	✓	✓	✓	✓
• Perimeter, area, volume	✓	✓	✓	
NON-LINEAR FUNCTIONS				
• Solving problems			✓	✓
• Graphs of $a = xy$ and $y = ax^2$		✓	✓	

Basic Algebra by Richard G. Brown, Geraldine D. Smith, and Mary P. Dolciani.
Houghton Mifflin Co., 1977. $8.25 (T.E.: $10.29)

This textbook was designed for those students who would normally have difficulty with a standard first-year algebra course. The lessons are short, easy to read, and contain many illustrative examples.

There is an abundance of classroom and written exercises. There are also thirty pages of Extra Practice Exercises. (Annotations at the end of selected lessons key these sets of exercises to the text.) Most of the exercises in Chapters 1 through 8 do not require the students to use their skills in decimals, fractions, and percents. In later chapters, students are asked to review these skills in order to apply them to solve equations and to solve real life problems. The word problems which occur throughout the text provide many practical applications.

The materials emphasize problem-solving and communication skills. Students are asked to refer to the Guide for Problem Solving in their text as problems are solved.

Special features of the text include: "Consumer Corner," a feature which appears at the end of each chapter to help students learn practical skills for everyday living; "Career Notebook," which illustrates many jobs that need a background in mathematics; "Puzzles and Things," and cartoons. Sections on "Reviewing Arithmetic Skills" occur in each unit.

The teacher's edition includes teaching suggestions, chalkboard examples, and extensions. Chapter tests and answers, an individualized assignment guide, and a table of related references are also provided. Supplementary materials include a test booklet containing progress tests and answers, and a solution key which provides step-by-step solutions for every written exercise and puzzle.

The School Mathematics Project (SMP) Books A-H, X, Y, and Z. Cambridge University Press, 1972-1975. Books A-H: $2.95 (T.E.: $8.95); X, Y, and Z: $4.95 (T.E.: $6.95)

The eight paperback books in the Basic Mathematics Series A - H are intended for average students from grades 7 to 10. Books X, Y, and Z continue this series for college-bound students. The program was written for students who would enroll in mathematics every year in high school.

Most of the objectives for Core Algebra are covered, but span all eleven books. It is possible to select those portions of the materials for a one-semester, Core Algebra course. However, SMP would probably be more successful if taught as a sequence. The variety of topics in each book provides a change of pace for the students and holds their interest.

The philosophy of SMP is very similar to that of the Mathematics Program Guide. Problem-solving is emphasized. There is much investigation and discovery by the students.

SMP will have to be supplemented. There are not enough exercises to develop the skills in algebra. There is also a great variation in the level of difficulties of the exercises.

The teacher's editions for Books A - H contain the pages from the students' books interleaved with comments and answers to questions. The comments try to show the purpose of new and unusual topics and fresh approaches to old topics; they provide occasional notes and references on the background to the mathematics and they suggest how to teach the topics.

The teacher's editions for Books X - Z provide the answers, but do not provide the student pages. Instead, there are more suggestions on teaching the topics in each book.

Algebra through Applications with Probability and Statistics by the First-Year
Algebra via Applications Development Project, Zalman Usiskin, Director.
National Council of Teachers of Mathematics, 1979. $9.50

This two-volume paperback text was developed from an NSF-funded project. The materials were designed for average first-year algebra students. All topics usually found in a traditional algebra course are included, except for the following: factoring of polynomials, fractional expressions and simplifications which require factoring, some complicated radical simplifications, and artificial word problems. The director states that "in their place, greater attention is given to the uses of numbers, operations, linear expressions, and relations, powers, and sentence-solving. Common statistical measures, the chi-square test, simple probability, sampling, and randomness are integrated into the course. The very large number of other applications include, wherever possible, problems which involve the analysis of actual data and real situations."

There is a major emphasis on reading. Each lesson is followed by questions of two types: "Questions covering the reading" and "Questions testing understanding of the reading." Many lessons also have "Questions for discussion and opinion" or "Questions extending the reading."

A reading level comparison of the text with two other widely-used first-year algebra textbooks, Holt Algebra I (Holt, Rinehart and Winston, 1974) and Algebra Structure and Method, Book 1 (Houghton Mifflin, 1976), was conducted by Dr. Gerald Kulm of Purdue University. On the basis of his analysis, Dr. Kulm concluded that the materials are written at a suitable level for first-year algebra students when compared with these two textbooks.

Problem-solving is emphasized. Communication skills in the classroom are also stressed.

The "Notes for the Teacher" includes an overview of each chapter, a list of minimal objectives for each chapter, comments for teaching each lesson, a suggested time schedule for each chapter, and an answer key for the student's text.

Algebra One by Clyde L. Corcoran, John F. Devlin, Edward D. Gaughan,
David C. Johnson, and Robert Wisner. Scott, Foresman and Co., 1977.
$8.95 (T.E.: $11.04)

This textbook is the first course in the Scott, Foresman algebra program. The relevance of algebra to real-world situations is emphasized throughout the program.

There are many illustrative examples which are clear and easy to follow. There are also many illustrations and diagrams.

Reading is minimal, but some of the content may be difficult for the students to understand because of unfamiliar terms and/or unfamiliar situations.

There are a large number of exercises to help the students learn the skills of algebra. Many of the exercises require use of their skills with decimals, fractions, and percents.

Problem-solving and communication in the classroom are emphasized in both the student text and the teaching suggestions.

Special features of the textbook include: "Calculating Clinics" which are placed throughout the first three chapters of the text to provide a review of basic skills of arithmetic, recreational puzzles and problems in "Take a Break," career exercises, "Math in Our Environment," and "Mathematical Excursions" which extend the mathematical content of the text. Challenge exercises for the better students and calculator and computer exercises occur where appropriate.

A teacher's edition of the text is available. The front matter features program highlights, description of program components, teaching and individualizing suggestions, and a daily time schedule. On the reproduced students' pages that follow, there are answers to the exercises and notes in the margin which include lesson objectives, purpose and background of lesson, teaching notes, reviews, and additional practice exercises. The supplementary materials include a test booklet and a solution key. The test booklet contains duplicating masters of two forms each of chapter, mid-book, and end-of-book objective tests, with answers. The solution key provides completely worked out solutions for every problem in the student's text.

Table 2

LEARNER OBJECTIVES	Laboratory Activities in Algebra	Geometric Algebra	Algebra (AIM)	Pre-Algebra with Pizzazz!
ALGEBRAIC EXPRESSIONS				
• Operations with polynomials	only mult	only mult		
• Operations with rational expressions				
• Evaluating and solving algebraic expressions			✓	✓
LANGUAGE OF ALGEBRA				
• Symbols and technical terms		✓	✓	
• Properties of number systems				✓
• Translating algebraic statements				
TABULAR RELATIONSHIP				
• Comparing tables				
• Preparation and uses of tables				
EQUATIONS				
• Writing algebraic expressions	✓			✓
• Linear equations			✓	✓
• Word problems			✓	✓
GRAPHS LINEAR FUNCTIONS				
• Ordered pairs and points	✓	✓	✓	✓
• Graphing linear functions	✓	✓	✓	✓
• Interpreting graphs of linear functions				
• Comparison of two linear functions				
• Problem-solving by graphs				
APPLICATIONS OF FORMULAS				
• Applications		✓	✓	✓
• Perimeter, area, volume		✓	✓	
NON-LINEAR FUNCTIONS				
• Solving problems				
• Graphs of $a = xy$ and $y = ax^2$	✓			

Geometric Algebra by David B. Spangler. J. Weston Walch, 1976. $3.50

This is an activity-oriented booklet designed to supplement a beginning algebra or geometry class.

Laboratory Activities in Algebra by William A. Miller. J. Weston Walch,
1974. $3.00 (T.E.: $5.00)

This is a booklet containing a number of laboratory activities in algebra. The activities are designed to be used to enrich and supplement instruction in a beginning algebra class.

Applications in Mathematics, Course A: Algebra by Donovan A. Johnson,
Viggo P. Hansen, Wayne H. Peterson, Jesse A. Rudneck, Ray Cleveland,
and L. Carly Bolstor. Scott, Foresman and Co., 1972. $1.71 (T.E.: $1.71)

This paperback unit presents some short, easy lessons in algebra. By presenting the materials through familiar real-life settings, students can get actively involved.

Pre-Algebra with Pizzazz!, Books AA and DD by Steve and Janis Marcy.
Creative Publications, 1978. $5.50 each.

These two books are part of a series of enrichment books designed to provide practice with skills and concepts taught in pre-algebra courses. The practice is provided in a variety of highly motivating puzzles that will capture and maintain student interest.

Books AA and DD provide practice in some of the algebraic skills and concepts. Book AA presents some puzzles dealing with the properties of number systems. Book DD offers ones on simplifying expressions, solving equations and inequalities, solving word problems, and graphing.

Part II: A Sample Course

This is a Core Algebra course based on the Basic Algebra textbook by Richard G. Brown, Geraldine D. Smith, and Mary P. Dolciani, published by the Houghton Mifflin Company. The course outline and the suggested time schedule are shown on the next pages. The time schedule is based on 45-minute periods which meet daily. It should be adapted to individual situations.

The Teacher Commentary follows the Course Outline and Suggested Time Schedule. Notes about most of the lessons are provided under the headings: Vocabulary, Comments, and Suggested Assignments.

The Vocabulary lists the new terms for the lesson. The teacher should point out these new terms to the students. He/she should help the students to pronounce the words correctly, to learn their meanings, and to use them properly.

Comments on instructional strategies are given under the second heading. Notes on ideas which should be emphasized in a class discussion as well as suggestions to encourage problem-solving behaviors by the students are provided. References are made to the lesson commentaries that appear in the teacher's edition of the textbook. These commentaries include the objectives of the lessons in the textbook, more teaching suggestions, chalkboard examples, and suggestions for extensions.

Suggested assignments are the recommended written assignments. Most of these are from the Basic Algebra textbook. Others are exercises from supplementary worksheets. (Master copies of these worksheets are provided for each unit.) Students should usually be able to start the assignments in class and complete them for homework. It is recommended that homework assignments be given after unit tests too. (For example, see Unit I, Lesson 13 on page 26).

Objectives are given for lessons requiring supplementary worksheets. The objectives for the other lessons are not listed since they are already given in the teacher's edition of the textbook.

Sample quizzes and tests are provided for each unit. The quizzes are usually between 5 and 15 minutes in length. The tests are about 45 minutes long.

COURSE OUTLINE AND
SUGGESTED TIME SCHEDULE FOR
CORE ALGEBRA

Introduction (1 day)

Announcements
Distribute book
Assign worksheet: Reading the textbook
and discuss the worksheet questions with the class

Unit I: Working with Variables (13 days)

Lesson 1: Using Letters for Numbers, pgs. 2 - 5

2: Parentheses, Order of Operations, pgs. 6 - 7

3: Coefficients and Terms, pgs. 8 - 9

4: Properties of Addition, pgs. 10 - 11

5: Exponents and Factors, pgs. 12 - 13

6: Properties of Multiplication, pgs. 14 - 15

7: The Distributive Property, pgs. 16 - 17

8: Properties of 0, pgs. 18 - 19

9: Properties of 1, pgs. 20 - 21

10: Introduction to Equations, pgs. 22 - 23

11: Introduction to Inequalities, pgs. 24 - 25

12: Reviewing Arithmetic Skills, pg. 26
Career Notebook, pg. 27
Reviewing the Chapter, pgs. 30 - 31

13: Unit I Test

Unit II: Solving Equations (17 days)

Lesson 1: Solving Equations by Addition, pgs. 34 - 35
Solving Equations by Subtraction, pgs. 36 - 37

2: Solving More Equations, pgs. 38 - 41

3: Solving Equations

4: Equations with More Steps, pgs. 42 - 45

5: Reading and Writing Algebraic Expressions (supplement)

6: More About Algebraic Expressions (supplement)

7: Writing Equations for Number Problems (supplement)

8: Combining Terms, pgs. 48 - 49

9: Combining Terms (continued)

10: Writing Algebraic Expressions, pgs. 50 - 53

11: Applied Problems and Puzzles, pgs. 54 - 57

12: Variable on Both Sides of the Equation, pgs. 58 - 59

13: Equations with Parentheses, pgs. 60 - 61

14: Puzzles, pgs. 62 - 63

15: Reviewing the Chapter, pgs. 66 - 67

16: Cumulative Review, pg. 68

17: Unit II Test

Unit III: Positive and Negative Numbers (12 days)

Lesson 1: Positive and Negative Numbers, pgs. 72 - 73
Inequalities and Graphs, pgs. 74 - 75

2: Addition, pgs. 76 - 77
Subtraction, pgs. 78 - 81

3: Reviewing Addition and Subtraction

4: Simplifying Expressions, pgs. 82 - 83

5: Multiplication, pgs. 84 - 85
Division, pgs. 88 - 89

6: Simplifying Expressions, pgs. 86 - 87

7: Solving Equations, pgs. 90 - 91

8: Reviewing Solving Equations

9: Reviewing Arithmetic Skills, pg. 94
Career Notebook, pg. 95
Reviewing the Chapter, pgs. 98 - 99

10: Cumulative Review for Chapters 1-3, pg. 438

11: Cumulative Review for Chapters 1-3, pgs. 438 - 439 (continued)

12: Unit III Test

Unit IV: Formulas (11 days)

Lesson 1: Perimeter Formulas, pgs. 102 - 103
2. Area Formulas, pgs. 104 - 107
3: Area Formulas II
4: Making Tables to Find the Maximum Area of Rectangles (supplement)
5: Pick's Rule (supplement)
6: Writing Formulas, pgs. 112 - 113
7: Motion Formulas, pgs. 114 - 117
8: Cost and Money Problems, pgs. 118 - 121
9: Reviewing the Chapter, pgs. 130 - 131
10: Cumulative Review, pg. 132
11: Unit IV Test

Unit V: Working with Polynomials (13 days)

Lesson 1: Addition, pgs. 136 - 137
2: Subtraction, pgs. 138 - 139
3: Multiplying Monomials, pgs. 140 - 141
4: Powers of Monomials, pgs. 142 - 143
5: Polynomials Times Monomials, pgs. 144 - 145
6: Multiplying Polynomials, pgs. 146 - 147
7: Multiplying at Sight, pgs. 148 - 151
8: Square of a Binomial, pgs. 152 - 153
9: Division with Monomials, pgs. 154 - 155
10: Reviewing Arithmetics Skills
Career Notebook
Consumer Corner
11: Reviewing the Chapter, pgs. 166 - 167
12: Review
13: Unit V Test

Unit VI: Factoring (4 days) - Optional

Lesson 1: Factoring in Arithmetic, pgs. 170 - 171

2: Common Monomial Factors, pgs. 172 - 173

3: Review

4: Unit VI Test

Unit VII: Graphs (11 days)

Lesson 1: Graphs You Often See, pgs. 204 - 207

2: Graphs with Lines and Curves, pgs. 208 - 211

3: Graphs with Lines and Curves (continue)

4: Points on a Graph, pgs. 212 - 215

5: Solution Pairs, pgs. 216 - 219

6: Graphs of Equations, pgs. 220 - 221

7: Looking at Graphs (supplement)

8: Non-Linear Graphs (supplement)

9: Review Arithmetic Skills, pg. 228
Career Notebook, pg. 229
Consumer Corner, pgs. 230 - 231

10: Reviewing the Chapter, pgs. 232 - 233

11: Unit VII Test

TEACHER COMMENTARY

Introduction

Objective:	To become familiar with the textbook.
Comments:	After the textbooks have been distributed to the students, have them work on the worksheet titled, "Reading the Textbook." Then have them discuss the answers to the questions. For some of the students, this exercise will be a real eye-opener! Throughout the study of the course, you should provide opportunities for the students to use the table of contents, the index, and the glossary. For example, refer the students to the glossary if they do not remember the meaning of the term, "coefficient."
Suggested Assignments:	"Reading the Textbook" worksheet

Introduction:
Reading the textbook

Name ______________________________

Date ______________________________

Referring to your textbook, answer the following questions.

______________________________ 1. What is the title of the book?

____

______________________________ 2. Who are the authors?

____

______________________________ 3. Who published the book?

____

______________________________ 4. How recent is the book?

______________________________ 5. How many chapters does the book contain?

______________________________ 6. On what page does Chapter 4 begin?

______________________________ 7. Within each chapter, the book is divided into what?

______________________________ 8. What does the symbol, "(a, b)" stand for?

9. On what page does the discussion for each of the following topics begin?

______________________________ a. Slope of a line

______________________________ b. Distributive property

______________________________ 10. a. Is there a glossary? If so, on what page does it begin?

______________________________ b. What does it mean by "evaluate"?

____

______________________________ 11. Are there any tables in the book?

Unit I

Lesson 1: Using Letters for Numbers, pgs. 2 - 5

Vocabulary: variable, variable expression, value of an expression

Comments: Read T34 - 35*

Another suggestion for teaching these pages: Discuss using a calculating machine, showing several examples. An overhead transparency master is provided.

Stress that any letter may be used as a variable. Sometimes students mistakenly think that only x is a variable since it is used most often.

Students are introduced to the notation for multiplication when a variable is used, that is,
$2n$ ⟵ means the same as ⟶ $2 \cdot n$
ax ⟵ means the same as ⟶ $a \cdot x$
Caution students that 23 is NOT $2 \cdot 3$!

Be sure to provide the opportunity for practice in reading the expressions aloud. For example, they should see that the expression "$c \div 2$" is "c divided by 2, where c stands for a number" or "a number c divided by 2".

Suggested Assignments: Written Exercises 1 - 43 , pgs. 4-5

Lesson 2: Parentheses, Order of Operations, pgs. 6 - 7

Vocabulary: parentheses, order of operations

Comments: Read T35 - 36

Another suggestion for teaching these pages: Begin the lesson by introducing some of the grouping symbols that are used to show exactly how we want an expression to be calculated:

( )	parentheses	{ }	braces
[ ]	brackets	—	bar

Review examples like those below:
To simplify expressions, work inside grouping symbols first.

Here we Subtract first

Example 1: Simplify

$$\begin{aligned}&(50 - 14) + 1\\ &= 36 + 1\\ &= 37 \text{ answer}\end{aligned}$$

---

* Pages refer to the lesson commentary in the Teacher's edition of Basic Algebra.

Example 2: Simplify

$$8 - (3 \overset{\boxed{\text{Multiply first}}}{\cdot} 2)$$
$$= 8 - 6$$
$$= 2 \quad \text{answer}$$

Example 3: Simplify

$$\frac{6 \cdot (7 \overset{\boxed{\text{Subtract first}}}{-} 2)}{5}$$
$$= \frac{6 \cdot 5}{5}$$
$$= 6 \quad \text{answer}$$

Then present an expression like the one below (which has no grouping symbols) and ask them to find the value for the expression:

$$25 - 6 \cdot 3 + 4 - 10 \div 2$$

After providing some time for the students to work on the problem, discuss the answers they obtain. Then tell the class that to avoid confusion, they will have to agree on the order in which the operations in an expression are to be performed. Explain that an order of operation has been agreed upon by mathematicians.

first, do all multiplications and divisions from left to right,
next, do all additions and subtractions from left to right.

After discussing this rule, you may want to review the following examples:

1) $3 + 7 \cdot 5$
2) $12 \div 2 + 4 \div 2$
3) $4 + 27 \div 3 \times 2 - 6$

Suggested
Assignments: Written Exercises 1 - 30, pg. 7
Worksheet 1

Lesson 3: Coefficients and Terms, pgs. 8 - 9

Vocabulary: coefficient, terms, like and unlike terms, simplify

Comments: Read T36

Suggested
Assignments: Written Exercises 1 - 36, pg. 9

Lesson 4: Properties of Addition, pgs. 10 - 11

Vocabulary: commutative property, associative property

Comments: Read T37

Stress that the operation sign is for the term that immediately follows it. For example, in the expression, 5c + 7 - 3 + 2c, the minus sign preceding the 3 applies only to the 3. It is not for the 2c.

Suggested Assignments: Written Exercises 1 - 30 , pg. 11
Self-Test , pg. 11

QUIZ 1 Anytime after lesson 4

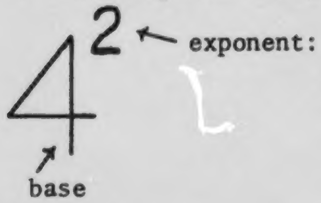
Lesson 5: Exponents and Factors, pgs. 12 - 13

Vocabulary: exponents, powers, squared, cubed, factor

Comments: Read T37 - 38

Another suggestion for teaching these pages:
You may want to start the lesson by discussing the factors of a term. (See the discussion on the bottom of page 12.)

Follow this with a discussion on exponents.
You may want to begin the discussion by first using numbers as the base. For example, you could explain that another way of writing 4 • 4 is 4^2 and 4 • 4 • 4 is 4^3. Then explain the following:



how many times the base is used as a factor

read as
"four to the second power" or
"4 squared"

Be sure to provide the opportunity for the students to read aloud and write the expression. For instance, in reviewing exercises 1 through 5 in the Classroom Practice, you could ask the students to do these things:
(1) read the expression (more than one way, if possible),
(2) tell how the expression can be written without exponents,
(3) find the value of the expression.

Suggested Assignments: Written Exercises 1 - 26, pg. 13
Worksheet 2

Lesson 6: Properties of Multiplication, pgs. 14 - 15

Vocabulary: evaluate

Comments: Read T38 - 39

Begin the lesson by reviewing the commutative and associative properties for addition. Then ask the class whether they think the properties also apply to multiplication.

Suggested Assignments: Written Exercises 1 - 34 , pg. 15

Lesson 7: The Distributive Property, pgs. 16 - 17

Vocabulary: distributive property

Comments: Read T39

Another suggestion for teaching these pages:

Start the lesson by presenting the following problem to the students:

> Jerry works part-time at a store. He is paid $3 an hour and worked 4 hours one day and 5 hours the next day. What was his total earnings for the two days?

Discuss the two ways to compute his earnings:

1) $3 \cdot 4 + 3 \cdot 5 = 12 + 15 = 27$
Therefore, he earned $27

2) $3(4 + 5) = 3 \cdot 9 = 27$
Therefore, he earned $27

Either way you get the same result, thus,

$$3(4 + 5) = 3 \cdot 4 + 3 \cdot 5 .$$

Tell the students that this example shows the distributive property.

Suggested Assignments: Written Exercises 1 - 30 , pg. 17

Lesson 8: Properties of 0, pgs. 18 - 19

Comments: Read T40

Be sure to stress the five properties of 0 shown on page 18. Discuss the reasons why properties 2 and 3 must be true.

Suggested Assignments: Written Exercises 1 - 31, pg. 19

Lesson 9: Properties of 1, pgs. 20 - 21

Comments: Read T41

Be sure to stress the three properties of 1 shown on page 20.

Suggested Assignments:
Written Exercises 1 - 26, pg. 21
Exercises 1 - 28 on the top of page 408
Self-Test, pg. 21

QUIZ 2 Anytime after Lesson 9

Lesson 10: Introduction to Equations, pgs. 22 - 23

Vocabulary: number sentence, equations, solution, root

Comments: Read T41

This lesson introduces the "guess and evaluate" method for finding solutions to equations.

You may want to give examples for writing equations for Exercises 15-18.

Suggested Assignments:
Written Exercises 1 - 14, 15 - 29 (odds), pg. 23
Reviewing the Chapter 2 - 44 (evens), pg. 30

Lesson 11: Introduction to Inequalities, pgs. 24 - 25

Vocabulary: inequality

Comments: Read T42

This lesson introduces the "guess and evaluate" method for finding solutions to inequalities. Be sure that students feel comfortable with the symbols and can use them easily. Elicit from the students the fact that the symbols $>$ and $<$ point toward the lesser number.

Suggested Assignments: Written Exercises 1 - 30, pg. 25
Self-Test, pg. 25
Reviewing the Chapter 46 - 92(evens), pgs. 30 - 31

Lesson 12: Reviewing Arithmetic Skills, pg. 26
Career Notebook, pg. 27

Comments: Discuss the Career Notebook with the students in class. Assign the rest of the exercises in the Reviewing the Chapter for in-classwork. Have the students discuss the exercises that presented them difficulty.

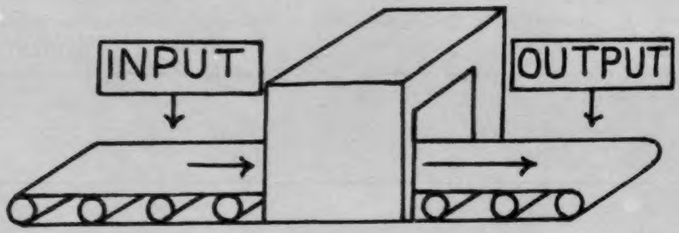
The Reviewing Arithmetic Skills may be assigned for homework.

Suggested Assignments: Reviewing Arithmetic Skills, pg. 26(all)
Reviewing the Chapter, 93 - 102(all), pg. 31

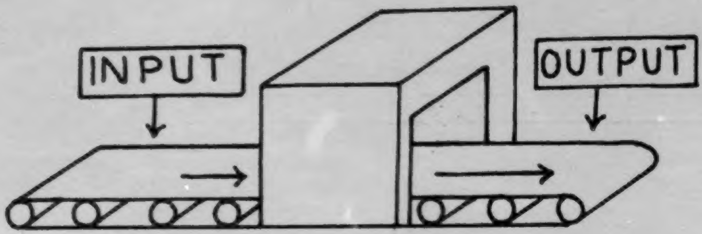
Lesson 13: Unit I Test

Comments: Assign the students to read page 34 in their textbook and to try the Classroom Practice Exercises on page 35.

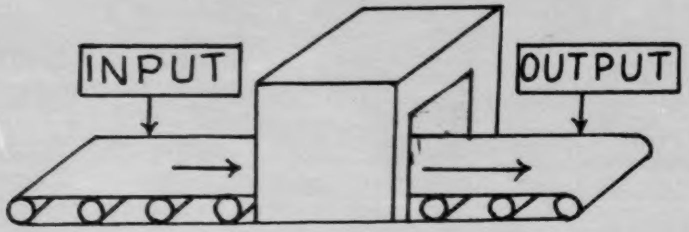
Unit I, Lesson 1
Transparency



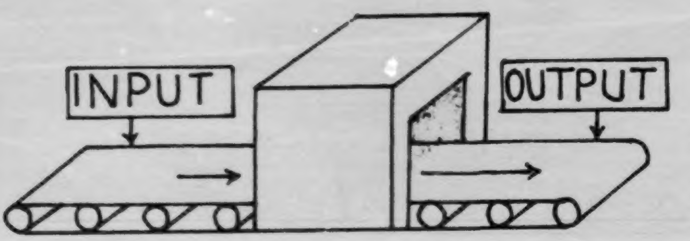
INPUT	OUTPUT



INPUT	OUTPUT



INPUT	OUTPUT



INPUT	OUTPUT

Unit I, Lesson 2

Worksheet 1

Name ______________________

Date ______________________

Find the value of each expression. Show your 'scratch-work'/calculations in the space provided. Circle your final answer.

1. $6 + (5 \cdot 2)$

2. $(8 \cdot 3) + 9$

3. $7 + 6 \cdot 4 - 3$

4. $12 - (3 + 4)$

5. $3 \cdot 6 + 7 \cdot 0$

6. $(12 + 4) \div (10 - 2)$

7. $9 \div 3 + 2 \cdot 6$

8. $\dfrac{60 - 5}{10 + 1} + 6$

9. $(12 \cdot 2) - (6 \cdot 3)$

10. $6 + (15 \div 3)$

11. $5 - 8 \div 4$

12. $8 - 4 \div 2 + 1 \cdot 5$

13. $15 - 3 + 4 - 7$

14. $8 + (4 + 6) \div 2$

15. $\dfrac{4 + 14 \div 2 + 5}{2 + 7 - 5}$

Unit I, Lesson 5 Name________________________

Worksheet 2 Date________________________

A. Write these expressions using exponents.

________ 1. W squared

________ 2. r cubed

________ 3. 7 to the third power

________ 4. d to the eighth power

________ 5. the cube of x

________ 6. the square of 8

B. Write the larger number in the blank.

________ 7. 2^3 or 3^2

________ 8. 3^4 or 4^3

________ 9. 4^5 or 5^4

________ 10. 2^5 or 5^2

Unit I, Quiz 1 Name__________________________

1. If $y = 18$ and $w = 7$, find the value of each expression.

__________ a. $y + w - 6$

__________ b. $5y$

2. Find the value of each expression.

__________ a. $(12 - 5) \cdot (2 + 3)$

__________ b. $8 + 5 \cdot 4 - 2$

__________ c. $3 \cdot 6 + 2 \cdot 7$

3. Simplify if possible. If you cannot simplify, write not possible.

__________ a. $7a + 8 - a + 5$

__________ b. $8n + 6 + 4p$

__________ c. $10xy - 2xy + 7 - 2 + 3xy$

__________ d. $3a + 9 + 10a - 8$

__________ e. $8m + 3k - 3 - 6m$

****

Unit I, Quiz 2 Name__________________________

1. Find the value of each expression, if possible. If not, write impossible.

__________ a. 6^3 __________ c. $(50 \cdot 95) \cdot 2$

__________ b. $\frac{9 \cdot 0}{7}$ __________ d. $\frac{38}{0}$

2. Simplify each expression.

__________ a. $8(w - 6) + 5w$

__________ b. $(4b)(4b)$

__________ c. $5 \cdot 3 \cdot x \cdot x \cdot y \cdot y \cdot y$

__________ d. $\frac{9n}{n}$

__________ e. $5(x + 2) - 10$

__________ f. $k(6k - 2m)$

Unit Test

Name ______________________________

Date ______________________________

Show all your written work on the test sheets. Place your answers in the space provided.

1. If $x = 6$ and $y = 3$, find the value of each expression below:

______ a. $x + 7 - y$

______ b. $5x$

______ c. $18 \div y$

______ d. $7(x - 4)$

2. Find the value of each expression.

______ a. $6 + 2 \cdot 8$

______ b. $3 \cdot 4 + 8 \div 2$

______ c. $(9 - 3) \div 3 - 2$

3. Simplify if possible. If you cannot simplify, write not possible.

______ a. $5a - a + 6 + 3a - 5$

______ b. $4xy + 3 + 4y$

______ c. $3x + 4y + x - 3y$

______ d. $6a + 5b - 6a - 2b$

______ e. $16x + 4(5 - 4x)$

4. Find the value of each expression.

______ a. 4^2

______ b. 2^4

______ c. four cubed

(Go on to the next page.)

5. Simplify.

_______ a. $4 \cdot (7y)$

_______ b. $d(3d)(5d)$

_______ c. $8 \cdot x \cdot x \cdot x \cdot x \cdot 6 \cdot x$

6. Simplify.

_______ a. $3(x + 4) + 5$

_______ b. $7(4b - 8)$

_______ c. $8(1 + 3c) - 10c$

_______ d. $x(2x - y)$

_______ e. $6(3a - 2b)$

_______ f. $3(x - 4) + 8x + 15$

7. Let $x = 9$. Find the value if possible. If not, write impossible.

_______ a. $3(x - 9)$

_______ b. $\frac{x - 9}{x}$

_______ c. $\frac{x + 9}{x - 9}$

_______ d. $\frac{9}{x}$

8. Tell which of the numbers are solutions.

_______ a. $5x - 7 = 13$ 3, 4, or 5?

_______ b. $2 + 3x = 11$ 2, 3, or 4?

_______ c. $x + 7 > 21$ 13, 14, or 15?

_______ d. $4w + 6 < 35$ 6, 7, or 8?

ANSWER KEY

Worksheet 1

1. 16 2. 33 3. 28 4. 5 5. 18
6. 2 7. 15 8. 11 9. 6 10. 11
11. 3 12. 11 13. 9 14. 13 15. 4

Worksheet 2

A. 1. w^2 2. r^3 3. 7^3 4. d^8
5. x^3 6. 8^2

B. 7. 3^2 8. 3^4 9. 4^5 10. 2^5

Quiz 1

1. a. 19 b. 90

2. a. 35 b. 26 c. 32

3. a. $6a + 13$ b. not possible c. $11xy + 5$
d. $13a + 1$ e. $2m + 3k - 3$

Quiz 2

1. a. 216 b. 0 c. 9500 d. impossible

2. a. $13w - 48$ b. $16b^2$ c. $15x^2y^3$
d. 9 e. $5x$ f. $6k^2 - 2km$

Unit I Test

1. a. 10 b. 18 c. 6 d. 20

2. a. 22 b. 16 c. 0

3. a. $7a + 1$ b. not possible c. $4x + y$
d. $4a$ e. 30

4. a. 25 b. 32 c. 64

5. a. $15x$ b. $28c^3$ c. $48x^5$

6. a. $3x + 17$ b. $15a - 35$ c. $8 + 14c$
d. $2x^2 - xy$ e. $18a - 12b$ f. $11x + 3$

7. a. 0 b. impossible c. 0 d. 1

8. a. 6 b. 3 c. 13 d. 4, 5

Unit II

Lesson 1: Solving Equations by Addition, pgs. 34 - 35 and Solving Equations by Subtraction, pgs. 36 - 37

Comments: Read T43 - T44

Have students discuss examples of undoing things in everyday life. For example, you put on a pair of socks, then your shoes, and then tie your shoelaces. To "undo" this, you untie your shoelaces, remove the shoes, and then you remove the socks.

Be sure to stress that the students think about what they are doing when solving equations. You can encourage this by asking questions like, "How was the equation built?" and "What must be done to undo the equation?"

Encourage students to do one or more steps in their heads.

Suggested Assignments: Written Exercises 2 - 48(evens), pg. 35
Written Exercises 2 - 32(evens), pg. 37

Lesson 2: Solving More Equations, pgs. 38 - 41

Comments: Read T44 - T45

You may want to begin the lesson by a review of lesson 1. Ask students to solve the following equations:

1) $a + 8 = 17$
2) $k - 9 = 5$
3) $16 = 4 + x$
4) $40 = m - 2$

Then you can introduce solving equations by multiplication or division.

Suggested Assignments: Written Exercises 2 - 44(evens), pg. 39
Mixed Practice Exercises 2 - 32(evens), pg. 37

Lesson 3: Solving Equations

Comments: The purpose of this lesson is to provide more practice in solving equations by adding, subtracting, multiplying, or dividing.

Suggested Assignments: Mixed Practice Exercises 1 - 62, pgs. 40 - 41
Self-Test, pg. 41

Lesson 4: Equations with More Steps, pgs. 42 - 45

Comments: Read T45 - T46

Encourage students to do one or more steps in their head.

Suggested Assignments: Written Exercises 1 - 54(odds), pgs. 43 - 44
Section C: Cross-Number Puzzle, pg. 45
Self-Test, pg. 45

QUIZ 1 Anytime after Lesson 4

Lesson 5: Reading and Writing Algebraic Expressions (supplement)

Objective: To read and write algebraic expressions that involve the four basic operations of arithmetic.

Vocabulary: plus, sum, added to, more than, increased by, minus, difference, subtracted from, less than, decreased by, times, product, multiplied by, divided by, quotient, twice, thrice

Comments: Examine with the class the different ways of reading the expressions: $n + 6$, $n - 6$, $6n$, and $\frac{n}{6}$. One suggestion: place each expression on the blackboard and have students contribute to the ways of reading it. (Have students make a copy of the list for reference.) Some of the ways of reading each expression are listed below:

$n + 6$	$n - 6$
n plus 6	n minus 6
sum of n and 6	difference of 6 from n
6 added to n	6 subtracted from n
6 more than n	*6 less than n
n increased by 6	n decreased by 6

$6n$	$\frac{n}{6}$
6 times n	n divided by 6
product of 6 and n	the quotient of n by 6
n multiplied by 6	one-sixth of n

Be sure to discuss the other ways of reading a multiplication expression like 2n and 3n, that is, "twice n" and "thrice n".

For the Classroom Practice Exercises 1 and 2 on Worksheet 1, a student may point out that $x + 2 = 2 + x$ and thus give the same response to each, the student is, of course, correct. Note that while it is similarly true for exercises 7 and 8, by convention, 6w is written instead of w6. Be sure to point out the importance of the order of the number and the variable for exercises 3 and 4, and 5 and 6.

---

* Note the difference between this expression and "6 is less than n", which is written algebraically as "$6 < n$" or "$n > 6$."

Suggested
  Assignments: Worksheet 1

Lesson 6: More About Algebraic Expressions (supplement)

Objectives:

1) Write an algebraic expression to represent a verbal expression.
2) Write a verbal expression to represent an algebraic expression.

Comments: You may want to begin the lesson by asking the students to write an algebraic expression for each of the following verbal expressions. (You may want to copy the exercises on the board or you may want to dictate them aloud to provide practice in receiving oral instructions.)

1) the sum of b and 9
2) the product of 3 and H
3) g decreased by 7
4) R divided by 2
5) Two-thirds of U

If your students show that they are still having difficulty with these problems, it may be necessary to review more problems like these first.

Then discuss each example below with the students:

Have students read aloud.

Example 1: Translate "The sum of four times a number and 6"

Solution:
Let n = the number
Then $4n$ = four times the number
$4n + 6$ = The sum of four times the number and 6

Answer: $4n + 6$

Example 2: Translate "Four subtracted from twice a number"

Solution:
Let n = the number
Then $2n$ = twice the number
$2n - 4$ = Four subtracted from twice a number

Answer: $2n - 4$

After working through each example, replace the variables by some numbers. This will stress the point that these letters do indeed represent numbers.

For the Classroom Practice exercises 1 - 5 on Worksheet 2, have students do these orally. Encourage discussion. Remind students that there is sometimes more than one possible description.

For the remainder of the Classroom Practice exercises, have students write out the answers. Be sure to stress again that any letter can be used to represent the numbers.

Suggested Assignments: Worksheet 2

QUIZ 2 Anytime after Lesson 6

Lesson 7: Writing Equations for Number Problems (supplement)

Objective: Given a verbal problem, writes an appropriate equation, solves the equation, interprets the problem in terms of the problem setting.

Comments: Refer the students to the Guide for Problem Solving on student's page 54 as the following examples are discussed.

Chalkboard Examples:

Example:
1. Read the problem.
   7 more than three times a number is 31. Find the number.
2. Let n = the number.
3. $3n + 7 = 31$
   $3n = 24$
   $n = 8$
4. Answer: $n = 8$ → the number is 8
5. Check: $3(8) + 7 = 31$
   $24 + 7 = 31$ (CHECKS!)

Example:
1. Read the problem.
   When 9 is subtracted from twice a number, the result is 17. Find the number.
2. Let x = the number.
3. $2x - 9 = 17$
   $2x = 26$
   $x = 13$
4. Answer: $x = 13$ → the number is 13
5. Check: $2(13) - 9 = 17$
   $26 - 9 = 17$ (CHECKS!)

Suggested Assignments: Written Exercises 55 - 60, pg. 44
Worksheet 3

Lesson 8: Combining Terms, pgs. 48 - 49

Comments: Read T47 - T48

Suggested Assignments: Written Exercises 1 - 24, pg. 48

Lesson 9: Combining Terms (continue)

Comments: If more practice is needed for exercises like 1 - 24 on page 48, assign exercises 1 - 18 (evens) in the middle section of page 410.

Suggested Assignments: Written Exercises 25 - 31, pg. 49
Self-Test, pg. 49

QUIZ 3 Anytime after Lesson 9

Lesson 10: Writing Algebraic Expressions, pgs. 50 - 53

Comments: Read T48 - T49

Refer students to their list of reading expressions for Lesson 5, if they need to.

Have the students discuss the answers for the three chalkboard examples on T48 - T49.

Be sure to discuss the classroom practice exercises on page 51 as a class.

Suggested Assignments: Written Exercises 1 - 22, pgs. 51 - 53

Lesson 11: Applied Problems and Puzzles, pgs. 54 - 57

Vocabulary: consecutive numbers

Comments: Read T49 - T50

You may want to begin the lesson by presenting the chalkboard example problem to the students. Ask questions like the following and discuss their answers with your students:

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. If n represents the number of people on the first night, what expression represents the number of people on the second night?
5. What equation will help you solve this problem?
6. What is the answer to the question?
7. Does your answer check?

Then have the students read the examples that appear on pages 54 and 55. Have them answer some questions as they review the examples. (A master copy of these questions is provided.)

Open your book to page 54. Answer these questions as you read the problem that appears on that page:

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. a. What does x stand for?
   b. What does $x + 7$ stand for?
5. What equation was written to solve the problem?
6. What is the answer to the problem?
7. Does the answer check?

Now look at the example on page 55. As you read the problem answer the following questions:

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. a. What does x stand for?
   b. What does $2x$ stand for?
5. What equation was written to solve the problem?
6. What is the answer to the problem?
7. Does the answer check?

Suggested Assignments: Written Exercises 1 - 12, pgs. 55 - 56
Self-Test, pg. 57

QUIZ 4 Anytime after Lesson 11

Lesson 12: Variable on Both Sides of the Equation, pgs. 58 - 59

Comments: Read T50

Encourage students to do one or more steps in their head if they can.

Suggested Assignments: Written Exercises 1 - 40, pg. 59

Lesson 13: Equations with Parentheses, pgs. 60 - 61

Comments: Read T50 - T51

Suggested Assignments: Written Exercises 1 - 29, pg. 61
Reviewing the Chapter 1 - 26, pg. 66

Lesson 14: Puzzles, pgs. 62 - 63

Comments: Read T51

Discuss the chalkboard examples with the class. You may want to ask questions like those listed in Lesson 11.

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. a. What does x stand for?
   b. What expression represents the number of calories in a piece of pizza?
5. What equation was written to solve the problem?
6. What is the answer to the problem?
7. Does the answer check?

Suggested Assignments: Written Exercises 1 - 6, pgs. 62 - 63
Self-Test, pg. 63

QUIZ 5 Anytime after Lesson 14

Lesson 15: Review

Suggested Assignments: Reviewing the Chapter 27 - 46, pgs. 66 - 67

Lesson 16: Cumulative Review

Comments: Remind students to refer to the previous sections if they have any difficulty.

Suggested Assignments: Written Exercises 1 - 34, pg. 68

Lesson 17: Unit II Test

Comments: Some of the students may complete the test before the end of the period. Have them start on the assignments suggested below in class and then complete the rest for homework.

Suggested Assignments: Read pages 72 - 73.
Do Classroom Practice 1 - 10, pg. 73.
Do Written Exercises 1 - 19, pg. 73.

Unit II, Lesson 5

Worksheet 1

Name______________________________

Date______________________________

Classroom Practice

Write an algebraic expression for each of the following.

______________ 1. x plus 2

______________ 2. 2 plus x

______________ 3. 7 subtracted from Y

______________ 4. Y subtracted from 7

______________ 5. K divided by 3

______________ 6. 3 divided by k

______________ 7. 6 times w

______________ 8. w times 6

______________ 9. g less than 10

______________ 10. 7 increased by P

Written Exercises

Write an algebraic expression for each of the following:

______________ 1. sum of b and 6

______________ 2. M multiplied by 7

______________ 3. 3 more than r

______________ 4. t increased by 1

______________ 5. n divided by 3

______________ 6. 2 less than n

______________ 7. a times c

______________ 8. e added to d

______________ 9. twice m

______________ 10. 2 subtracted from k

______________ 11. one-third of x

______________ 12. A plus 20

______________ 13. product of 12 and y

______________ 14. A decreased by 2

______________ 15. one-seventh of f

______________ 16. twice D

______________ 17. w less than v

______________ 18. product of 0 and J

______________ 19. quotient of x by 4

______________ 20. p minus o

Unit II, Lesson 6 Name ______________________________

Worksheet 2 Date ______________________________

Classroom Practice

Describe these algebraic expressions. There is sometimes more than one possible description.

____________________ 1. $3x + 5$, if x is a number.

____________________ 2. $2y - 1$, if y is a number.

____________________ 3. $\frac{c}{3} - 4$, if c is a number.

____________________ 4. $5 - 8k$, if k is a number.

____________________ 5. $7x - 2x$, if x is a number.

Translate into an algebraic expression.

____________________ 6. Three times g plus h.

____________________ 7. Nine less than seven times a number.

____________________ 8. Four times a number decreased by 2.

____________________ 9. 3 added to 9 times a number.

____________________ 10. One more than twice a number.

Written Exercises

Translate into an algebraic expression.

____________________ 1. Seven less than nine times a number.

____________________ 2. The sum of twice m and 9.

____________________ 3. Four decreased by five times D.

____________________ 4. A number is doubled, then 10 is added.

____________________ 5. Fifteen times a number increased by 6.

____________________ 6. The product of a and b subtracted from 7.

____________________ 7. The sum of eight times a number and 2.

____________________ 8. Nine times a number plus 2 times the same number.

____________________ 9. A number is multiplied by 2 and then 6 is subtracted.

____________________ 10. 4 more than the quotient of k divided by 2

(Go on to the next page.)

Unit II, Lesson 6
Worksheet 2 - Page 2

Describe these algebraic expressions. There is sometimes more than one possible description.

____________________ 11. $2x - 5$, if x is a number.

____________________ 12. $a + 4$, if a is a number.

____________________ 13. $3m + 1$, if m is a number.

____________________ 14. $10 - y$, if y is a number.

____________________ 15. $7h - 3$, if h is a number.

____________________ 16. $\frac{1}{4}k$, if k is a number.

____________________ 17. $6 - 3x$, if x is a number.

____________________ 18. $2y + 5y$, if y is a number.

____________________ 19. $\frac{n}{8} + 2$, if n is a number.

____________________ 20. $9n - 2n$, if n is a number.

Unit II, Lesson 7 Name ____________________

Worksheet 3 Date ____________________

Write an equation for each problem. Then solve. Refer to the Guide for Problem-Solving on page 54 if you need to.

__________ 1. Six more than four times a number is 14. Find the number.

__________ 2. Twice a number increased by 3 is 37. Find the number.

__________ 3. When 6 is subtracted from five times a number, the result is 29. What is the number?

__________ 4. When 7 is added to three times a number, the result is 19. Find the number.

__________ 5. The sum of twice a number and three is 19. What is the number?

__________ 6. One less than eight times a number is 63. What is the number?

__________ 7. The difference between three times a number and 8 is 21. Find the number.

__________ 8. Four times a number decreased by two is 18. What is the number?

Unit II, Lesson 11 Name________________________

Reading Guide Date________________________

Open your book to page 54. Answer these questions as you read the problem that appears on that page.

________________________ 1. What is the problem about?

____

________________________ 2. What information is given?

____

________________________ 3. What are you to find?

____

________________________ 4. a. What does x stand for?

________________________ b. What does x + 7 stand for?

________________________ 5. What equation was written to solve the problem?

________________________ 6. What is the answer to the problem?

________________________ 7. Does the answer check?

Now look at the example on page 55. As you read the problem answer the following questions:

________________________ 1. What is the problem about?

____

________________________ 2. What information is given?

____

________________________ 3. What are you to find?

____

________________________ 4. a. What does x stand for?

________________________ b. What does 2x stand for?

________________________ 5. What equation was written to solve the problem?

________________________ 6. What is the answer to the problem?

________________________ 7. Does the answer check?

Unit II

Quiz 1

Name______________________________

Date______________________________

Solve each of the equations. Be sure to check your work.

__________ 1. $17m = 51$

__________ 2. $\frac{f}{9} = 11$

__________ 3. $3x + 6 = 27$

__________ 4. $y + 43 = 91$

__________ 5. $b - 14 = 25$

__________ 6. $4x + 3 = 47$

__________ 7. $48 = x - 120$

__________ 8. $\frac{a}{7} = 9$

__________ 9. $61 = 7w - 2$

__________ 10. $2n - 6 = 32$

Unit II Name ____________________

Quiz 2 Date ____________________

Write an algebraic expression for each of the following:

____________ 1. K increased by 6

____________ 2. The product of 7 and b

____________ 3. Four more than three times a

____________ 4. W divided by y

____________ 5. The sum of four times x and seven

____________ 6. 3 subtracted from n

____________ 7. 8 added to twice f

____________ 8. Six decreased by five times p

Describe each algebraic expression.

____________ 9. 6k + 2, if k is a number

____________ 10. 9x - 10, if x is a number

Unit II

Quiz 3

Name________________________

Date________________________

Solve each equation. Check.

______ 1. $9x + 2 + 3x = 26$

______ 3. $18 = 5x + 2x - 3$

______ 2. $19 = 8d - 3d + 4$

______ 4. $9n + 1 - 5n = 29$

Write an equation. Then solve for the variable.

5. Twice a number added to three times the same number is 65. What is the number?

6. Seven more than five times a number is 52. Find the number.

Unit II Name______________________________

Quiz 4 Date______________________________

__________ 1. Keith has twice as much candy as John.
Let y = John's amount of candy.
Then __?__ = Keith's amount of candy.

__________ 2. Toby is x years old.
How old will she be in 3 years?

__________ 3. There are 7 more girls here than boys.
Let b = number of boys.
Then __?__ = number of girls.

__________ 4. Ann has $2 less than Brenda.
Let m = Brenda's amount of money.
Then __?__ = Ann's amount.

__________ 5. Jenny has twice as much money as David.
Together they have $84.
How much does David have?

__________ 6. A team played 92 games.
They won 28 more games than they lost.
How many games did they win?

Unit II

Quiz 5

Name______________________________

Date______________________________

Solve.

__________ 1. $9m = 3m + 6$

__________ 3. $2(7 + h) = 18$

__________ 2. $6x - 8 = 2x$

__________ 4. $4n + 7 = 6n - 9$

5. One number is 3 more than another.
4 times the smaller number is 2 less than twice the larger.
Find the numbers.

Unit II Test

Name____________________________

Date____________________________

Show all your written work on the test papers. Place your answer in the space provided.

Solve each of the following equations.

________ 1. $c - 11 = 10$

________ 2. $b + 6 = 18$

________ 3. $7c = 42$

________ 4. $\frac{d}{9} = 8$

________ 5. $6c + 5 = 23$

________ 6. $27 = x - 9$

________ 7. $6n - 1 = 35$

________ 8. $2m + 9 = 31$

Complete the following:

________ 9. The Pirates won six more games than they lost.

Let x = number of games lost.

Then __?__ = number of games won.

________ 10. Sam is v years old.

Then Sam was __?__ years old 2 years ago.

11. Anne has three times as much money as Cathy. Cathy has $6 more than Bill.

Let b = Bill's amount of money. Then,

________ a. __?__ = Cathy's amount of money and

________ b. __?__ = Anne's amount of money

(Go on to the next page.)

Write an equation. Then solve for the variable.

________ 12. Three times a number plus 4 times the same number is 28. What is the number?

________ 13. There are 950 students at Wood High School. There are 50 more girls than boys. How many girls are there?

________ 14. A piece of apple pie has 300 more calories than a glass of milk. Two pieces of apple pie have as many calories as 5 glasses of milk. How many calories in each?

Solve and check.

________ 15. $8e = 5e + 6$

________ 18. $4(2y + 1) = 28$

________ 16. $9 - 3b = 5b - 7$

________ 19. $8a - 1 = 2a + 23$

________ 17. $9y = 13 - 4y$

________ 20. $3(x - 1) = 9 + x$

Unit II

ANSWER KEY

Worksheet 1

Classroom Practice:

1. x + 2 OR 2 + x
2. 2 + x OR x + 2
3. Y - 7
4. 7 - Y
5. $\frac{k}{3}$
6. $\frac{3}{k}$
7. 6w
8. w6 or 6w
9. 10 - g
10. 7 + p

Written Exercises:

1. b + 6
2. 7M
3. r + 3
4. t + 1
5. $\frac{n}{3}$
6. n - 2
7. ac
8. d + e
9. 2m
10. k - 2
11. $\frac{1}{3}x$
12. A + 20
13. 12y
14. A - 2
15. $\frac{1}{7}f$
16. 2D
17. v - w
18. OJ
19. $\frac{x}{4}$
20. p - o

Worksheet 2

Classroom Practice:

Answers may vary. Here are examples of possible answers.

1. Three times a number plus 5 OR 5 more than three times a number
2. Twice a number minus 1 OR 1 less than twice a number
3. 4 less than a number divided by 3 OR the quotient of a number divided by 3 minus 4
4. 5 minus 8 times a number OR 8 times a number subtracted from 5
5. Twice a number subtracted from seven times the same number

6. 3g + h
7. 7x - 9, if x is a number
8. 4y - 2, if y is a number
9. 9a + 3, if a is a number
10. 2c + 1, if c is a number

Written Exercises:

1. 9x - 7, if x is a number
2. 2m + 9
3. 4 - 5D
4. 2y + 10, if y is a number
5. 15r + 6, if r is a number
6. 7 - ab
7. 8d + 2, if d is a number
8. 9w + 2w, if w is a number
9. 2p - 6, if p is a number
10. $\frac{k}{2} + 4$

(Go on to the next page.)

Answers may vary. Here are examples of possible answers:

11. 5 less than twice a number OR Two times a number minus 5
12. The sum of a number and 4 OR 4 added to a number
13. 1 more than three times a number OR Three times a number increased by 1
14. A number subtracted from 10 OR 10 minus a number
15. Seven times a number decreased by 3 OR 3 less than 7 times a number
16. One-fourth of a number OR A number multiplied by 1/4
17. Three times a number subtracted from 6 OR Six minus three times a number
18. The sum of twice a number and five times the same number OR Five times a number added to twice a number
19. Two more than a number divided by 8 OR Two added to the quotient of a number divided by 8.
20. Twice a number subtracted from nine times the same number OR Nine times a number minus twice the same number

Worksheet 3

1. Let x = a number
   $4x + 6 = 14$
   $x = 2$
   Answer: 2

2. Let x = a number
   $2x + 3 = 37$
   $x = 17$
   Answer: 17

3. Let x = a number
   $5x - 6 = 29$
   $x = 7$
   Answer: 7

4. Let x = a number
   $3x + 7 = 19$
   $x = 4$
   Answer: 4

5. Let x = a number
   $2x + 3 = 19$
   $x = 8$
   Answer: 8

6. Let x = a number
   $8x - 1 = 63$
   $x = 8$
   Answer: 8

7. Let x = a number
   $3x - 8 = 21$
   $x = 10$
   Answer: 10

8. Let x = a number
   $4x - 2 = 18$
   $x = 5$
   Answer: 5

Quiz 1

1. $m = 3$
2. $f = 99$
3. $x = 7$
4. $y = 48$
5. $b = 39$
6. $x = 11$
7. $x = 168$
8. $a = 63$
9. $w = 9$
10. $n = 19$

Quiz 2

1. $k + 6$
2. $7b$
3. $3a + 4$
4. $\frac{w}{y}$
5. $4x + 7$
6. $n - 3$
7. $2f + 8$
8. $6 - 5p$

Answers may vary for problems 9 and 10,
Here are examples:

9. Two more than six times a number
10. Nine times a number decreased by ten

(Go on to the next page.)

Quiz 3

1. x = 2
2. d = 3
3. x = 3
4. n = 7

5. Let n = a number
3n + 2n = 65
n = 13
Answer: 13

6. Let y = a number
5y + 7 = 52
y = 9
Answer: 9

Quiz 4

1. 2y
2. x + 3
3. b + 7
4. m - 2

5. Let d = David's amount of money
Then 2d = Jenny's amount of money
d + 2d = 84
d = 28
Answer: David has $28

6. Let x = number of games lost
Then x+28 = number of games won
x + x + 28 = 92
x = 32
x + 28 = 60
Answer: 60 games won

Quiz 5

1. m = 1
2. x = 2
3. h = 2
4. n = 8

5. Let x = one number
Let x + 3 = other number
4x = 2(x + 3) - 2
x = 2
x + 3 = 5
Answer: 2, 5

Unit II Test

1. c = 21
2. b = 12
3. c = 6
4. d = 72
5. c = 3
6. x = 36
7. n = 6
8. m = 11
9. x + 6
10. v - 2
11. a. b + 6
    b. 3(b + 6)

12. Let n = a number
3n + 4n = 28
n = 4
Answer: 4

13. Let b = number of boys
Then b + 50 = number of girls
b + b + 50 = 950
b = 450
Then b + 50 = 500
Answer: 500 girls

14. Let m = number of calories in a glass of milk
Then m + 300 = number of calories in a piece of apple pie
2(m + 300) = 5m
Then m = 200
m + 300 = 500
Answer: 200 calories in a glass of milk
500 calories in a piece of apple pie

15. e = 2
16. b = 2
17. y = 1
18. y = 3
19. a = 4
20. x = 6

Unit III

Note: The signs for the positive and negative numbers in the textbook are not raised, i.e., the numbers are written as +5 or -5 instead of $^{+}5$ or $^{-}5$. Students should become familiar with both forms.

Lesson 1: Positive and Negative Numbers, pgs. 72 - 73 and Inequalities and Graphs, pgs. 74 - 75

Vocabulary: positive numbers, negative numbers, zero, integers, positive integers, negative integers

Comments: Read T52 - T53

NOTE: The number lines that appear on page 72 show only the integers. Be sure to point out to the students that the number lines also include numbers like: $-\frac{1}{2}$, 2.3, $-3\frac{3}{4}$, 0.8, and so on.

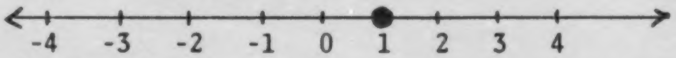
Be sure to provide the opportunity for the students to read aloud and write positive and negative numbers.

In comparing numbers, remind students that the number to the right of another on the number line is the greater one.

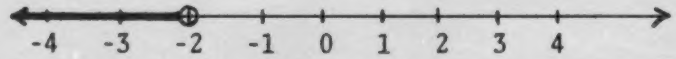
Add the following to the chalkboard examples for the section on Inequalities and Graphs:

8. Write an equation or inequality for each solution shown on the number line:

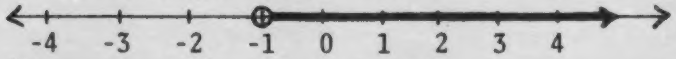
a.



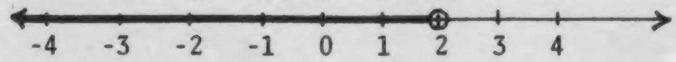
b.



c.



d.



Suggested
Assignments: Written Exercises 1 - 35 (odds), pg. 75
Worksheet 1
Self-Test, pg. 75

QUIZ 1 Anytime after Lesson 1

Lesson 2: Addition, pgs. 76 - 77 and Subtraction, pgs. 78 - 81

Vocabulary opposite

Comments: Read T54 - T55

Be sure to provide the opportunity for the students to read the problems aloud and explain how they got their answers. To avoid confusion between reading "—8" as "the opposite of 8" or "negative 8", lets agree that "¯8" is read as "negative 8" and that "—(8)" is read as "the opposite of 8".

You should also provide practice in deciding the sign of the sum or difference before actually finding the answer.

Review the Classroom Practice exercises as a class.

Suggested
Assignments: Written Exercises 1 - 34 (evens), pg. 77
Written Exercises 1 - 46 (evens), pgs. 80 - 81

Lesson 3: Reviewing Addition and Subtraction

Suggested
Assignments: Exercises 1 - 14, pg. 412 (Middle Section)
Mixed Practice Exercises 1 - 32 (all), pg. 81

Lesson 4: Simplifying Expressions, pgs. 82 - 83

Comments: Read T55 - T56

Remind the students that n means 1n and -n means ¯1n to ease their simplification of expressions like - n + 5n and 3n - n .

Suggested
Assignments: Written Exercises 1 - 28, pg. 83
Self-Test, pg. 83

QUIZ 2

Anytime after Lesson 4

Lesson 5: Multiplication, pgs. 84 - 85 and Division, pgs. 88 - 89

Comments: Read T56 - T57 and T58 - T59

You may want to use the teaching strategy described on page 84 for multiplication. Discuss with the students the following ideas:

1) the multiplication of two positive numbers gives a positive number.

examples: a. $6 \times 2 = 2 + 2 + 2 + 2 + 2 + 2 = 12$

b. $2 \times 5 = 5 + 5 = 10$

2) the multiplication for a negative number by a positive number gives a negative number.

examples: a. $2 \times {}^-3 = {}^-3 + {}^-3 = {}^-6$

b. $4 \times {}^-5 = {}^-5 + {}^-5 + {}^-5 + {}^-5 = {}^-20$

Then point out to the students that when the sign of one factor is changed, the sign of the product is changed.

examples: a.

$$\begin{array}{rcccl} & 6(2) & = & 12 & \\ \boxed{\text{opposites}}\!-\!\!\! & \updownarrow & & \updownarrow & \!\!\!-\!\boxed{\text{opposites}} \\ & 6({}^-2) & = & {}^-12 & \end{array}$$

examples: b.

$$\begin{array}{rcccl} & 2(5) & = & 10 & \\ \boxed{\text{opposites}}\!-\!\!\! & \updownarrow & & \updownarrow & \!\!\!-\!\boxed{\text{opposites}} \\ & 2({}^-5) & = & {}^-10 & \end{array}$$

Use this pattern to show the multiplication of a positive number by a negative number, and the multiplication of two negative numbers.

examples: a.

$$\begin{array}{rcccl} & 6(2) & = & 12 & \\ \boxed{\text{opposites}}\!-\!\!\! & \updownarrow & & \updownarrow & \!\!\!-\!\boxed{\text{opposites}} \\ & {}^-6(2) & = & {}^-12 & \end{array}$$

examples: b.

$$\begin{array}{rcccl} & 6({}^-2) & = & {}^-12 & \\ \boxed{\text{opposites}}\!-\!\!\! & \updownarrow & & \updownarrow & \!\!\!-\!\boxed{\text{opposites}} \\ & {}^-6({}^-2) & = & 12 & \end{array}$$

Be sure to provide practice in deciding beforehand what sign the product or the quotient will have.

Emphasize the difference between problems like $(-3)^2$ and $-(3)^2$.

Suggested Assignments: Written Exercises 1 - 52 (odds), pg. 85
Written Exercises 1 - 31 (odds), pg. 89

Lesson 6: Simplifying Expression, pgs. 86 - 87

Comments: Read T57 - T58

Students usually have difficulty with the following types of problems:

$-3(a - 4)$ and $-(x - 2)$

You may want to have the students rewrite:

"$-3(a - 4)$" as "${}^{-}3(a + {}^{-}4)$" and

"$-(x - 2)$" as "${}^{-}1(x + {}^{-}2)$"

before using the distributive property.

Suggested Assignments: Written Exercises 1 - 40, pg. 87
Worksheet 2

Lesson 7: Solving Equations, pgs. 90 - 91

Comments: Read T59

Be sure to encourage verbal communication. Have students explain how they solve equations.

Suggested Assignments: Written Exercises 2 - 36 (evens), pg. 91
Self-Test, pg. 91

QUIZ 3 Anytime after Lesson 7

Lesson 8: Reviewing Solving Equations

Comments: The purpose of this lesson is to provide more practice in solving equations.

Suggested
Assignments: Problems 1 - 27, pg. 413 (at the bottom of the page)
Reviewing the Chapter, 2 - 30 (evens), pg. 98

Lesson 9: Reviewing Arithmetic Skills, pg. 94 and Career Notebook, pg. 95

Comments: You may want to discuss the Career Notebook as a class.

Introduce the Reviewing Arithmetic Skills section by discussing the reasons for estimating and checking for reasonableness.

Suggested
Assignments: Career Notebook, pg. 95
Reviewing Arithmetic Skills, pg. 94
Reviewing the Chapter 32 - 102 (evens), pgs. 98 - 99

Lesson 10: Cumulative Review for Chapters 1-3, pg. 438

Suggested
Assignments: "Basic Skills": #1 - 42, pg. 438

Lesson 11: Cumulative Review for Chapters 1-3, pgs. 438-439

Suggested
Assignments: "Equations and Inequalities": #1 - 25, pgs. 438 - 439
"Problems": #1 - 5

Lesson 12: Unit III Test

Suggested
Assignments: Unit IV, worksheet 1

Unit III, Lesson 1 Name______________________________

Worksheet 1 Date______________________________

Write a positive or negative number.

__________ 1. A gain of 10 points

__________ 2. A loss of $25

__________ 3. A temperature 30° below zero

Compare the numbers. Write $>$ or $<$.

__________ 4. $^{-}10 \quad ? \quad ^{-}2$

__________ 5. $^{-}7 \quad ? \quad 4$

__________ 6. $0 \quad ? \quad ^{-}6$

__________ 7. $^{-}9 \quad ? \quad 15$

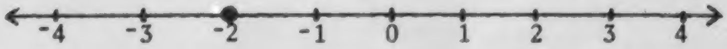
__________ 8. $^{-}100 \quad ? \quad ^{-}83$

__________ 9. $^{-}3 \quad ? \quad ^{+}12$

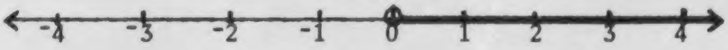
__________ 10. $^{-}28 \quad ? \quad -27$

Write an equation or inequality for each solution shown on the number line.

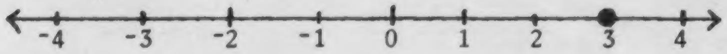
____________________ 11.



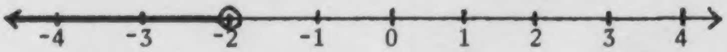
____________________ 12.



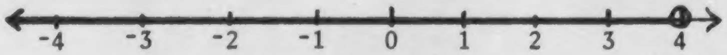
____________________ 13.



____________________ 14.



____________________ 15.



Graph the solution of the equation or inequality on a number line.

16. $y < 4$

17. $x + 3 = 7$

18. $a - 6 = 11$

19. $w > {}^{-}3$

20. $b > {}^{-}1$

Unit III, Lesson 7

Worksheet 2

Name ______________________

Date ______________________

Mixed Practice Exercises

Do the following problems.

________ 1. $^{-}6 + {}^{-}9$

________ 2. $^{-}16 \div 2$

________ 3. $18 - {}^{-}4$

________ 4. $7 \cdot {}^{-}3$

________ 5. $^{-}5(0)$

________ 6. $\frac{^{-}32}{4}$

________ 7. $^{-}1 - ({}^{-}14)$

________ 8. $^{-}8({}^{-}9)$

________ 9. $17 + ({}^{-}5)$

________ 10. $13 + {}^{-}13 + 0$

________ 11. $^{-}54 \div 6$

________ 12. $^{-}8 + 4$

________ 13. $^{-}6(100)$

________ 14. $^{-}3 - 12$

________ 15. $^{-}28 \div 4$

________ 16. $3 + {}^{-}4 + ({}^{-}8)$

________ 17. $8 \cdot 7$

________ 18. $^{-}11 - {}^{-}2$

________ 19. $\frac{63}{^{-}9}$

________ 20. $^{-}10({}^{-}6)$

Unit III

Quiz 1

Name ____________________

Date ____________________

Write in words, how you would read each number.

____________ 1. $^{+}15$

____________ 2. $^{-}26$

____________ 3. 9

Write in words, how you would read the inequality:

____________ 4. $^{-}1 < 2$

Compare the numbers. Write $>$ or $<$.

____________ 5. $^{-}6 \quad ? \quad ^{-}8$

____________ 6. $4 \quad ? \quad ^{-}5$

____________ 7. $^{-}7 \quad ? \quad 0$

Graph the solution of the equation on a number line.

8. $y - 3 = 5$ $\longleftrightarrow$

Graph the solutions of each inequality on a number line.

9. $x > {}^{-}4$ $\longleftrightarrow$

10. $x < 2$ $\longleftrightarrow$

Unit III

Quiz 2

Name________________________

Date________________________

Add or subtract.

________ 1. $7 + {}^{-}10$

________ 2. ${}^{-}9 - {}^{-}5$

________ 3. ${}^{-}16 + {}^{-}3$

________ 4. ${}^{-}4 - 2$

________ 5. $8 - ({}^{-}6)$

________ 6. ${}^{-}11 + 11$

Simplify.

________ 7. ${}^{-}4n + 12n$

________ 8. $3x^2 - 8x^2$

________ 9. ${}^{-}9p - 3p - 2$

________ 10. $5x + {}^{-}10x$

Unit III

Quiz 3

Name________________________________

Date________________________________

Multiply.

__________ 1. $^{-}7(2y)$

__________ 2. $^{-}8(9 - x)$

__________ 3. $^{-}5a(^{-}4b)$

__________ 4. $-x(x - 3)$

Divide.

__________ 5. $^{-}18 \div {}^{-}3$

__________ 6. $100 \div {}^{-}5$

__________ 7. $^{-}56 \div 7$

Simplify.

__________ 8. $-(^{-}3)^2$

__________ 9. $-(x - 9)$

__________ 10. $2b - (b + 7)$

__________ 11. $w - (w - 6)$

__________ 12. $-(y + 2)$

Solve for x.

__________ 13. $2x - 5x = 12$

__________ 14. $5x - (2x - 3) = 12$

__________ 15. $4x + 18 = 2x + 2$

Unit III Test

Name ______________________________

Add.

________ 1. $^{-}17 + {}^{-}8$

________ 2. $^{-}10 + 23$

________ 3. $9 + {}^{-}15$

Subtract.

________ 4. $8 - {}^{-}11$

________ 5. $^{-}3 - {}^{-}25$

________ 6. $^{-}6 - 13$

________ 7. $5 - 14$

Multiply.

________ 8. $(^{-}11)(9)$

________ 9. $(^{-}7)(^{-}15)$

Divide.

________ 10. $\frac{100}{^{-}4}$

________ 11. $^{-}54 \div 6$

________ 12. $\frac{^{-}124}{^{-}4}$

Compare the numbers. Write $>$ or $<$.

________ 13. $10 \quad ? \quad {}^{-}25$

________ 14. $^{-}420 \quad ? \quad {}^{-}300$

Multiply.

________ 15. $(y - 5)y$

________ 16. $-4x(-3y)$

________ 17. $^{-}3(^{-}2a - d)$

________ 18. $5(9 - x)$

Simplify.

________ 19. $-11a + 8b - 3a$

________ 20. $-(-x)^2$

________ 21. $8x - {}^{-}3x$

________ 22. $-c - (5c - 8)$

________ 23. $6y - 2(y - 3)$

________ 24. $3w^2 - 9w^2 - w^2$

(Go on to the next page.)

Solve for the variable.

________ 25. $3x - 7x + 5 = 13$

________ 27. $5x + 8 = 3x$

________ 26. $8t = 30 - 2t$

________ 28. $3(e - 2) = e - 4$

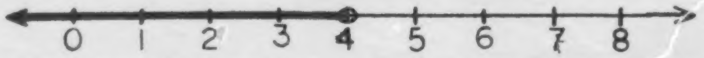
29. Graph the solution of $4x + 2 = -2$

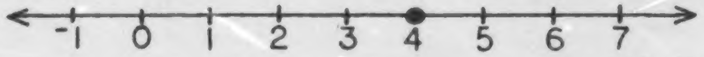
30. Graph the solutions of $x < 5$

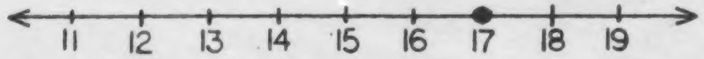
ANSWER KEY

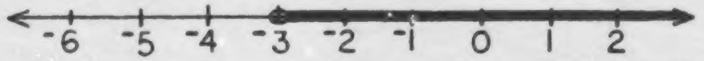
Worksheet 1

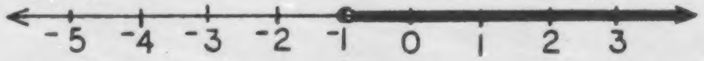
1. $^{+}10$ or 10
2. $^{-}25$
3. $^{-}30°$
4. $<$
5. $<$
6. $>$
7. $<$
8. $<$
9. $<$
10. $<$
11. $x = {}^{-}2$
12. $x > 0$
13. $x = 3$
14. $x < {}^{-}2$
15. $x < 4$

16.


17.


18.


19.


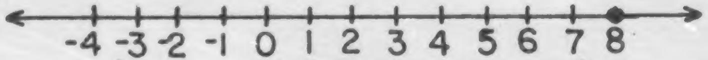
20.


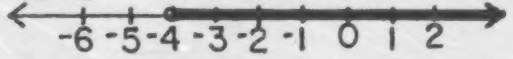
Worksheet 2

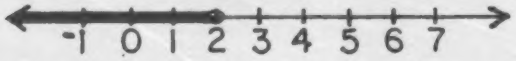
1. $^{-}15$
2. $^{-}8$
3. 22
4. $^{-}21$
5. 0
6. $^{-}8$
7. 13
8. 72
9. 12
10. 0
11. $^{-}9$
12. $^{-}4$
13. $^{-}600$
14. $^{-}15$
15. $^{-}7$
16. $^{-}9$
17. 56
18. $^{-}9$
19. $^{-}7$
20. 60

Quiz 1

1. positive fifteen
2. negative twenty-six
3. nine or positive nine
4. negative one is less than two
5. $>$
6. $>$
7. $<$

8.


9.


10.


Quiz 2

1. $^{-}3$
2. $^{-}4$
3. $^{-}19$
4. $^{-}6$
5. 14
6. 0
7. 8n
8. $^{-}5x^2$
9. $^{-}12p - 2$
10. $^{-}5x$

(Go on to the next page.)

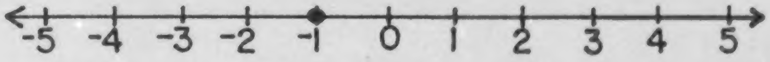
Quiz 3

1. $-14y$ 2. $-72 + 8x$ 3. $20ab$ 4. $-x^2 + 3x$ 5. 6
6. -20 7. -8 8. -9 9. $-x + 9$ 10. $b - 7$
11. 6 12. $-y - 2$ 13. $x = -4$ 14. $x = 3$ 15. $x = -8$

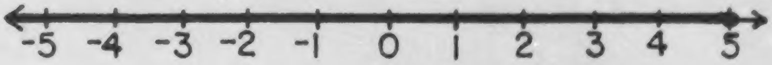
Unit III Test

1. -25 2. 13 3. -6 4. 19 5. 22
6. -19 7. -9 8. -99 9. 105 10. -25
11. -9 12. 31 13. $>$ 14. $<$ 15. $y^2 - 5y$
16. $12xy$ 17. $6a + 3d$ 18. $45 - 5x$ 19. $-14a + 8b$ 20. $-x^2$
21. $11x$ 22. $-6c + 8$ 23. $4y + 6$ 24. $-7w^2$ 25. $x = -2$
26. $t = 3$ 27. $x = -4$ 28. $e = 1$

29.



30.



UNIT IV

Lesson 1: Perimeter Formulas, pgs. 102 - 103

Vocabulary: perimeter, centimeter, decimeter, meter, kilometer, formulas, width, length, equilateral triangle, square, rectangle

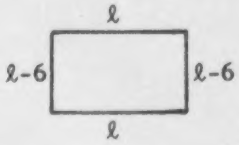
Comments: Read T60 - T61

Place the three figures on T60 on the chalkboard. Have the students discuss what it means to find the perimeter of a figure and the different units used to measure perimeter. Then ask them to find the perimeters of the three figures. For the third figure, omit the measure of the longest side (6x). Have students discuss how to obtain the side before finding the perimeter of the figure.

Have the students discuss how they obtained the perimeters of the figures on worksheet 1. Ask questions like "Can you think of another way to find the perimeter of an equilateral triangle besides adding up the measures of the three sides?" or "Is there an easier way to find the perimeter of a square?" to lead into a discussion on the formulas for the perimeter of an equilateral triangle, a square, and a rectangle.

The students should then discuss the solutions to the chalkboard examples on T60 - T61. An alternative method to solving a problem like example 1 (which seems easier for the students to understand) is as follows:

Solution: Let ℓ = length of the rectangle
$\ell - 6$ = width of the rectangle



Then

$$\ell + \ell - 6 + \ell - \ell - 6 = 60$$
$$4\ell - 12 = 60$$
$$4\ell = 72$$
$$\ell = 18$$
$$\ell - 6 = 12$$

Answer: length = 18 cm., width = 12 cm.

Be sure to stress that the unit of measurement must be given in the answer, if the unit of measurement is provided for the figure.

Suggested Assignments: Written Exercises 1 - 12, pg. 103
Exercises 1 - 9, p. 414 (Note: error in T.E. answer key - The answer for Problem 5 should be 4a - 2b)

Lesson 2: Area Formulas, pgs. 104 - 107

Vocabulary: area, square centimeter, square meter, square kilometer

Comments: Read T61 - T62

Begin the lesson by having the students discuss what it means to find the area of a figure. As suggested on T61, be sure to have them discuss the units used for measuring area and how they compare to those used for measuring length. They should also discuss when it is more appropriate to measure the area of a figure in one unit as compared to another unit.

Assign Worksheet 2. After the students have had some time to work on the problems, have them discuss how they obtained their answers. Ask questions which would lead into a discussion on the formulas for the area of a square, a rectangle, and a triangle.

Have the students discuss the solutions to the chalkboard examples on T62 (#1 - 3).

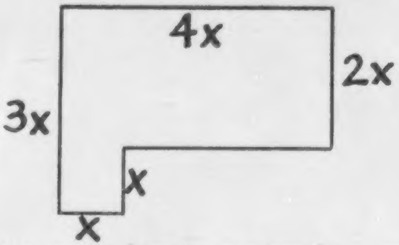
Suggested Assignments:
Worksheet 2
Classroom Practice Exercises 1 - 9, pg. 105
Written Exercises 1 - 8, pg. 106

Lesson 3: Area Formulas II

Comments: Place the following region on the chalkboard. Have the students discuss the two methods to find the area of the regions.

ALTERNATIVE METHODS

Example 1:

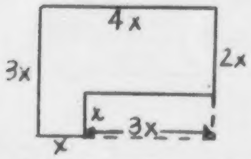


Solution 1: Area = area large rectangle - area small rectangle

$= 4x \cdot 3x - 3x \cdot x$

$= 12x^2 - 3x^2$

$= 9x^2$

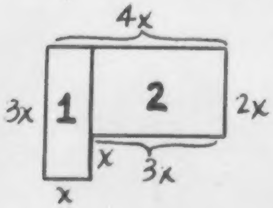


Solution 2: Area = area rectangle 1 + area rectangle 2

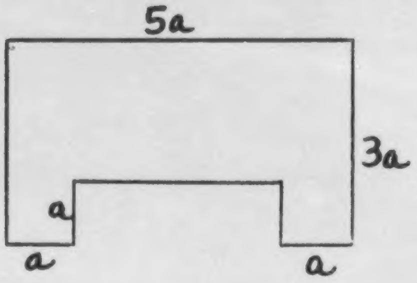
$= 3x \cdot x + 3x \cdot 2x$

$= 3x^2 + 6x^2$

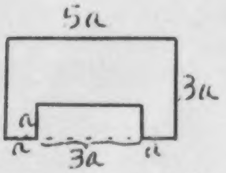
$= 9x^2$



Example 2:



Solution 1: Area = area large rectangle - area small rectangle

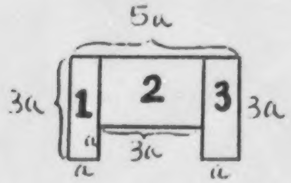


$= 5a \bullet 3a - 3a \bullet a$

$= 15a^2 - 3a^2$

$= 12a^2$

Solution 2: Area = area rectangle 1 + area rectangle 2 + area rectangle 3



$= 3a \bullet a + 3a \bullet 2a + 3a \bullet a$

$= 3a^2 + 6a^2 + 3a^2$

$= 12a^2$

Suggested Assignments: Written Exercises 9 - 22, pgs. 106 - 107
Exercises 1 - 5, pg. 414 (bottom section)

QUIZ 1 Anytime after Lesson 3

Lesson 4: Making Tables to Find the Maximum Area of Rectangles (supplement)

Objectives: Find the rectangle with a given perimeter that has the maximum area by making a table.

Comments: Place examples 1 and 2 on the chalkboard. Discuss them carefully with the students. For example 1, you may want to ask questions like the following:

1) How many meters of fencing does Sean have?
2) In the equation, "$\ell + w = \frac{1}{2}P$", what does "ℓ" stand for? w? P?
3) Why is the length plus the width of a rectangle equal to one-half the perimeter?
4) How was the equation, "$\ell + 3 = 8$", obtained?

For example 2, you may want to ask questions like:

1) What is the smallest width the pen could have? Then what must the length be to have a perimeter of 16 meters? (Sketch a picture.)
2) What is the next smallest width the pen could have? Then what must the length be to have a perimeter of 16 meters?

Suggested Assignments: Worksheet 3a - b: Practice Exercises 1 - 7(odds), Exercises 8 - 22(evens)

Lesson 5: Pick's Rule (supplement)

Vocabulary: boundary dots, interior dots

Materials: Worksheet 4a - e
dot paper

Comments: Introduce the lesson by having the students guess the area of Figure 1. (Figure 1 is on the transparency master which is provided.) This gets them involved and motivates the development of the formula. At the end of the lesson, the students should see that it is easier and more accurate to use the formula than to count unit areas.

Be sure to discuss with the students the purpose for a formula. Have them construct polygons with dot paper to test their formulas.

QUIZ 2 Anytime after Lesson 5

Lesson 6: Writing Formulas, pgs. 112 - 113

Vocabulary: rate

Comments: Read T63 - T64

Introduce the lesson by having the students find the answers to the following problems:

1) You ride your bike at 15 km/hr for 2 hours.
Find the distance you traveled.

2) You travel at 40 km/hr for 3 hours.
Find the distance you traveled.

3) Find the cost of 5 bags of potatoe chips at 79¢ each.

4) Find the cost of 6 doughnuts at 25¢ each.

Suggested Assignments: Written Exercises 1 - 16, pg. 113

Lesson 7: Motion Formulas, pgs. 114 - 117

Comments: Read T64

Present the chalkboard example on T64 to the students. As you discuss the solution to the example with the class, ask the following questions:

UNDERSTANDING THE PROBLEM

1. What is the problem about?
2. What information is given?
3. What are you to find?

DEVISING A PLAN AND CARRYING OUT THE PLAN

4. Can we draw a picture of the problem?
5. Can we organize the data into a table?
6. What equation will help you solve the problem?
7. What is the answer to the equation?

LOOKING BACK

8. Does your answer check?

Then have the students read the examples that appear on pages 114 - 115. Have them answer the following questions as they review the examples. (A master copy of these questions is provided.)

Open your book to page 114. Answer these questions as you read example 1:

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. a. What does t stand for?
   b. What does 15t represent?
   c. What does 12t represent?
5. What equation was written to solve the problem?
6. What is the answer to the problem?
7. Does the answer check?

Now answer these questions as you read example 2:

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. Look at the table:
    a. What does r stand for?
    b. What does $r + 2$ stand for?
    c. What does $2r$ represent?
    d. What does $2(r + 2)$ represent?
5. What equation was written to solve the problem?
6. What is the answer to the problem?
7. Does the answer check?

Encourage the students to draw a sketch to help them understand what the problem is about.

Be sure the students understand how to make a table.

Suggested Assignments: Written Exercises 1 - 6, pgs. 116 - 117

QUIZ 3 Anytime after Lesson 7

Lesson 8: Cost and Money Problems, pgs. 118 - 121

Vocabulary: selling price, buying price, profit

Comments: Read T65

As suggested on T65, review examples of using the formula for cost. Present the chalkboard example to the students. Ask questions like those below:

1. What is the problem about?
2. What information is given?
3. What are you to find?
4. If n represents the number of boxes they bought, what expression represents the number of boxes they sold? Why?
5. Can we organize the data into a table?

(questions continued on next page.)

6. a. What expression represents the price for selling the boxes?
   b. What expression represents the price for buying the boxes?

7. What was their profit?

8. What equation will help you solve this problem?

9. What is the answer to the question?

10. Does the answer check?

Then have the students read the examples that appears on page 118. Have them answer the following questions as they read it. (A master is provided.)

1. What is the problem about?

2. What information is given?

3. What are you to find?

4. a. What does n represent?
   b. What does n - 2 represent?

5. Look at the table:

   a. What expression represents the selling price?
   b. What expression represents the buying price?

6. What is the profit?

7. What equation was written to solve the problem?

8. What is the answer?

9. Does the answer check?

Suggested Assignments: Written Exercises 1 - 6, pgs. 119 - 121
Self-Test , pg. 121

Lesson 9: Reviewing the Chapter, pgs. 130 - 131

Suggested
Assignments: Written Exercises 1 - 9, 14 - 19, pgs. 130 - 131
Cumulative Review 1 - 12, pg. 132

Lesson 10: Cumulative Review, pg. 132

Suggested
Assignments: Exercises 13 - 37, pgs. 132

Lesson 11: Unit IV Test

Suggested
Assignments: Read page 136
Do Classroom Practice Exercises 1 - 13, pgs. 136 - 137

Unit IV, Lesson 1

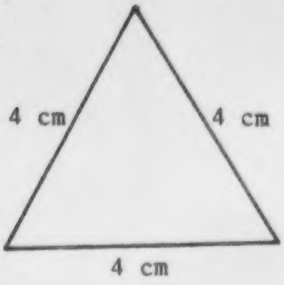
Name______________________________

Date______________________________

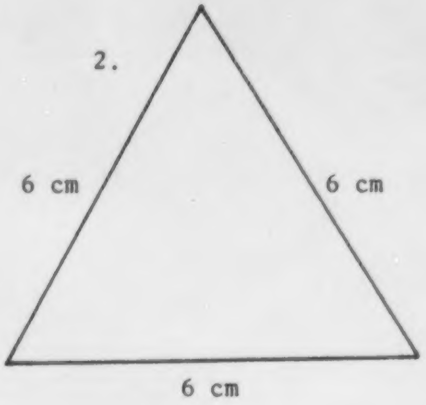
Worksheet 1

The distance around a figure is called its perimeter. Find the perimeter of the figures below.

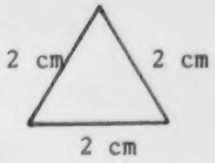
1.



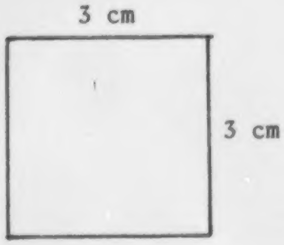
2.



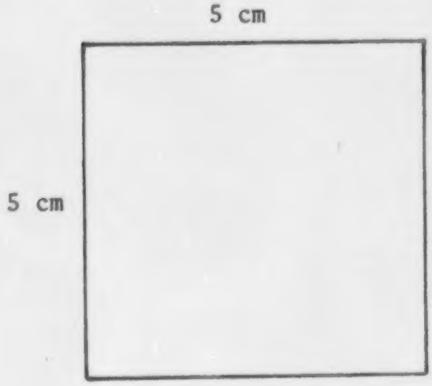
3.



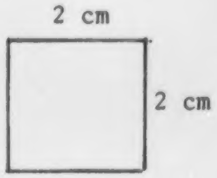
4.



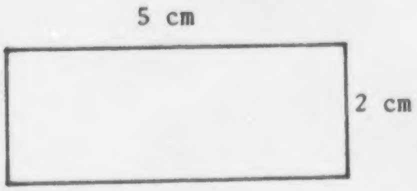
5.



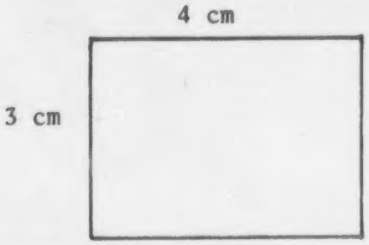
6.



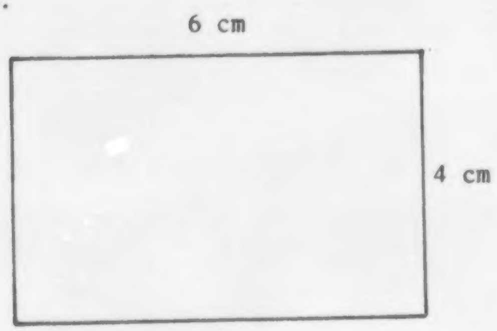
7.



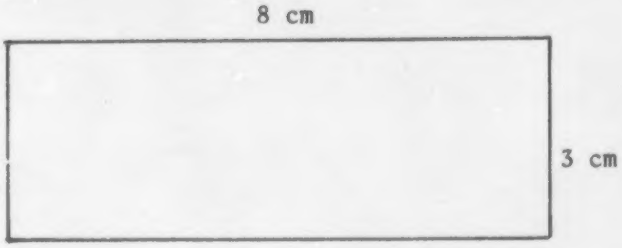
8.



9.



10.



Unit IV, Lesson 2

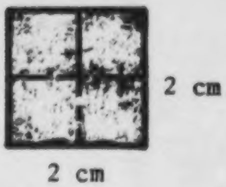
Worksheet 2

Name____________________________

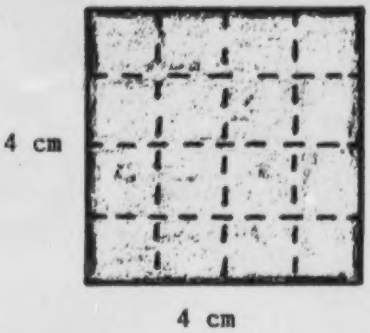
Date____________________________

Find the area of the shaded regions below.

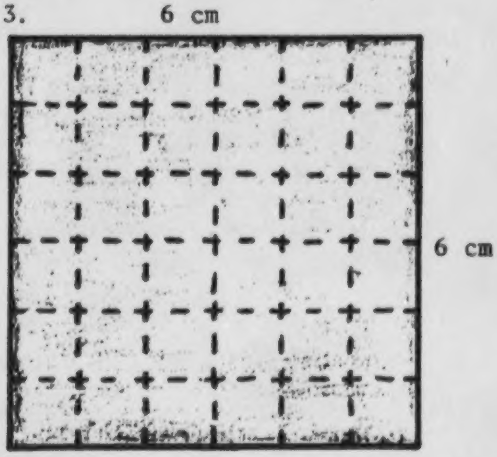
1.



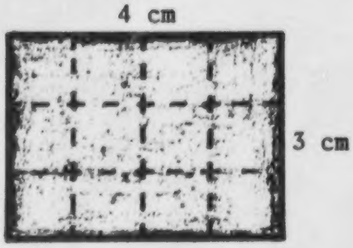
2.



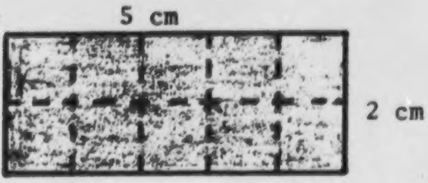
3.



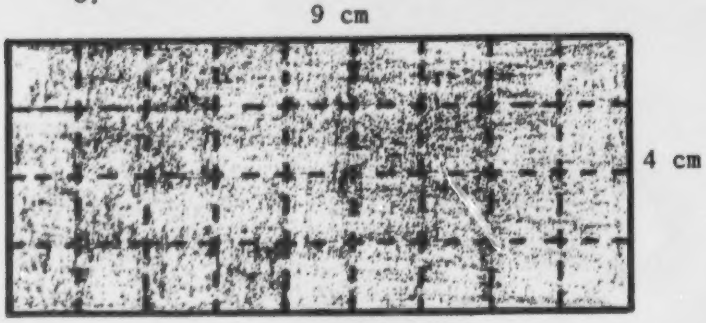
4.



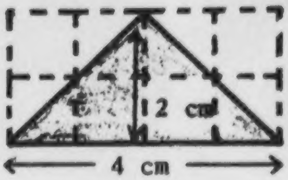
5.



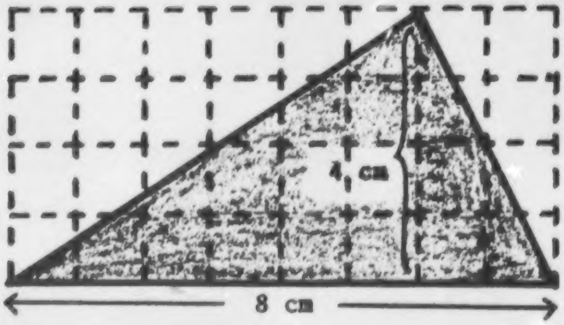
6.



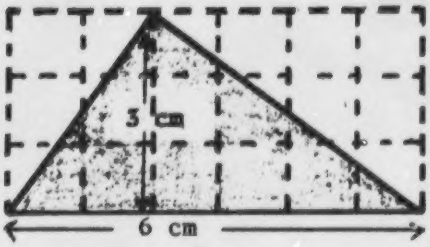
7.



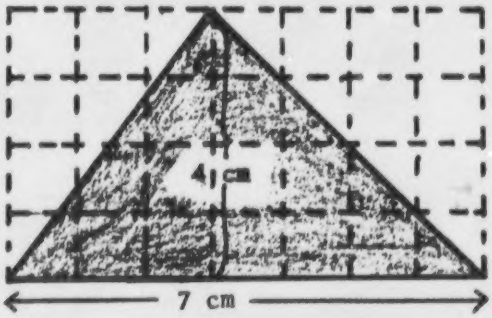
8.



9.



10.



Unit IV, Lesson 4
Worksheets 3a - b

LESSON 1

Making Tables to Find the Maximum Area of Rectangles

Sean has 16 one-meter sections of fencing to build a rabbit pen. The sections cannot be cut, so the fenced sides of the pen must be in whole units.

Example 1 Suppose that Sean builds a rectangular pen 3 meters wide. Find the length and the area of the pen.

SOLUTION: The length plus the width of a rectangle equals one-half the perimeter.

$$l + w = \tfrac{1}{2}P$$

$$l + 3 = 8$$

$$l = 5$$

$$A = l \cdot w$$

$$A = 5 \cdot 3$$

$$A = 15$$

Answer The pen is 5 meters (m) long. Its area is 15 square meters (m^2).

Example 2 Could Sean use the same fencing to build a rectangular pen with greater area? What dimensions give the maximum area?

SOLUTION: Make a table of all possible rectangles that have a perimeter of 16 meters and whole-unit sides.

	Length l	Width w	Area $l \cdot w$
	7	1	7
	6	2	12
	5	3	15
Maximum area	4	4	16
	3	5	15
	2	6	12
	1	7	7

Answer Yes. A pen 4 meters square has the maximum area.

From Algebra One by Clyde. L. Corcoran, John F. Devlin, Edward D. Gaughan, David C. Johnson, and Robert J. Wisner, Scott, Foresman and Co., 1977, pp. 138 - 139.

PRACTICE EXERCISES

Find the length and the area of each rectangle.

1. Perimeter: 24 meters
Width: 2 meters

2. Perimeter: 18 meters
Width: 4 meters

3. Perimeter: 16 meters
Width: 2 meters

4. Perimeter: 20 meters
Width: 7 meters

5. Perimeter: 13 meters
Width: 2 meters

6. Perimeter: 14 meters
Width: 4 meters

7. A rectangular pen is to be built from 12 one-meter sections of fencing. Complete the table to find the dimensions that give the maximum area.

Length	Width	Area
5	1	5
4		
3		
2		
1		

EXERCISES

Complete the table.

	Perimeter	Length	Width	Area
	20	6	4	24
8.	22		4	
9.	26	8		
10.	36	12		
11.	38		3	
12.	30	8		
13.	28		9	
14.	13		3	
15.	17	5		

Make a table for each exercise to show all the possible whole-unit dimensions for the rectangle. Tell which dimensions give the maximum area.

16. Perimeter: 24 meters

17. Perimeter: 28 meters

18. Perimeter: 32 meters

19. In exercises 16–18, what kind of rectangle has the maximum area?

What whole-unit dimensions give the maximum area for a rectangle with a perimeter of

20. 10 meters?

21. 16 meters?

22. 20 meters?

23. 30 meters?

ACTIVITY #4

PICK'S RULE

(To complete this activity, you will need either a geoboard or dot paper. Are you ready? ...Dot's good.)

This lesson is designed to lead us to a formula that will compute the area within any polygon on a geoboard or dot paper. Be sure to finish each step before attempting the next.

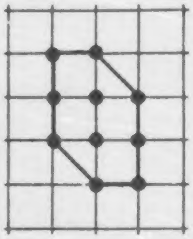


Figure 30

1. We begin by establishing a couple of ground rules.

   The polygon in Figure 30 has 8 dots on the boundary. This will be denoted as b = 8. There are 2 dots in the interior. This will be denoted as i = 2.

2. a. Compute the area of the polygons shown in Figure 31. Then record all required data in the chart below.

Figure 31

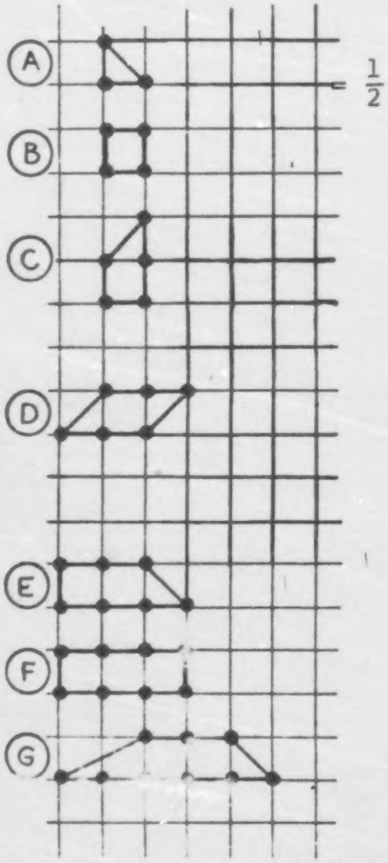


Table 2

(i) (b)

Fig.	Interior Dots	Boundary Dots	Area
A	0	3	½ sq. units
B			
C			
D			
E			
F			
G			

b. In each of the above polygons, there are ____ interior dots.

c. Increasing the number of boundary dots by 1 increases the area of each polygon by ____ sq. unit(s).

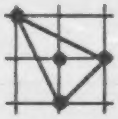
From Geometric Algebra by David B. Spangler, J. Weston Walch, 1976, pp. 123 - 127.

d. One of the formulas below yields the area of a polygon when the number of interior dots is 0. Experiment with these until you find the formula that works for any polygon, satisfying the condition that i = 0. (Remember, "b" refers to the number of boundary dots.) Circle the answer.

a. $\frac{b}{3} - \frac{1}{2}$ b. $\frac{b}{2} + 1$ c. $\frac{b}{2} + \frac{1}{2}$ d. $0 + \frac{b}{2} - 1$ e. $\frac{b}{2} - \frac{1}{2}$

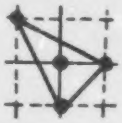
e. With a geoboard or dot paper, construct a few more polygons with no interior dots. Test to see if the formula you picked produces the correct area. If it does, continue to the next exercise. If it does not, go back and test another formula.

Ⓐ Figure 32



Solution:

To find the area of this triangle, construct 3 triangles around it to produce a square. By computing the area of the entire polygon, then subtracting the area of the 3 right triangles, we will obtain the area of the desired triangle.



Area of square = 2 x 2
= 4 sq. units

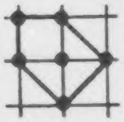
Sum of the areas of the 3 right triangles:

$1 + 1 + \frac{1}{2} = 2\frac{1}{2}$ sq. units

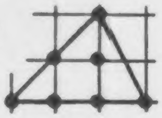
Area of desired triangle:

$4 - 2\frac{1}{2} = 1\frac{1}{2}$ sq. units.
ANSWER

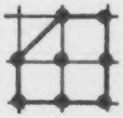
Ⓒ



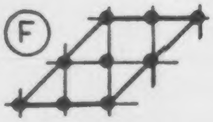
Ⓓ



Ⓔ



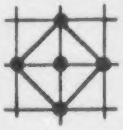
Ⓕ



3. The polygons in Figure 32 have 1 dot in the interior. Let's see if we can discover a formula that will find the area of these polygons.

a. Find the area of each polygon and enter all required date in the table below. (You may need to employ some creative techniques to compute the areas. See Polygon A.)

Ⓑ



Hint: Divide the polygon into 2 triangles. Then compute the area of each triangle. Each triangle has a height of 1 unit and a base of 2 units.

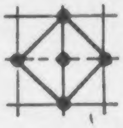


Table 3

Fig.	(i) Interior Dots	(b) Boundary Dots	Area
A	1	3	1½ sq. units
B			
C			
D			
E			
F			

b. Again, increasing the number of boundary dots by 1 increases the area of each polygon by ______ sq. unit(s).

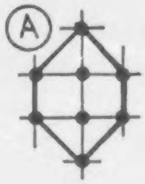
c. Construct a few polygons with b = 5 and i = 1. Is the area within all these polygons $2\frac{1}{2}$ sq. units? ______

d. Construct a few polygons with b = 6 and i = 1. What is the area within each one of these? ______ sq. units.

e. Circle the formula below that yields the area within a polygon when i = 1.

a. $\frac{b}{2} + 1$ b. $\frac{b}{2} - 1$ c. $0 + \frac{b}{2} - 1$ d. $\frac{b}{2} + \frac{1}{2}$ e. $1 + \frac{b}{2} - 1$

4. a. Make up your own polygons, each having 2 interior dots. (Figure 33.) Record the data in the table below. (Begin with b = 6.)



Invent your own polygons such that B has 7 boundary dots, C has 8, D has 9, and E has 10.

Figure 33

Table 4

Fig.	(i) Interior Dots	(b) Boundary Dots	Area
A	2	6	4 sq. units
B		7	
C		8	
D		9	
E		10	

b. Does increasing the number of boundary dots by 1 always increase the area within the polygon by $\frac{1}{2}$ sq. unit? ______

c. Our previous results have provided the following formulas:

When i = 0, Area = $0 + \frac{b}{2} - 1$

When i = 1, Area = $1 + \frac{b}{2} - 1$

What is the formula when i = 2? Area = ______ + _____ - ______

What do you suppose is the formula when i = 3? ___ + ___ - ___
(Construct a few polygons to test your findings.)

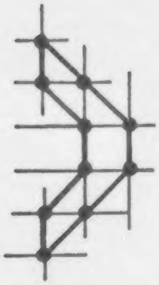
5. Each of the formulas we have discovered so far has been for specific values of i. A formula, however, is not "powerful" unless it works for any set of numbers. Put on your detective disguise and let's see if we can discover a formula that will compute the area within any polygon.

Carefully study the formulas in exercise #4, part c. Using "i" to indicate the number of interior dots and "b" to indicate the number of boundary dots, try to write a formula for the area within any polygon. (The formula must be in terms of "i" and "b.")

Formula: ______________________

6. The formula we established in exercise #5 is known as Pick's Rule. Use it to determine the area within the polygons in Figure 34.

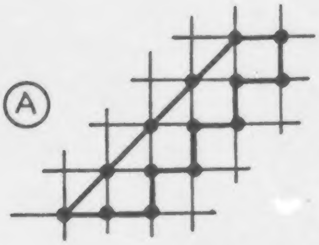
Example



$i = 0$
$b = 10$

$$\text{Area} = i + \frac{b}{2} - 1 = 0 + \frac{10}{2} - 1 = 5 - 1 = 4 \text{ sq. units}$$

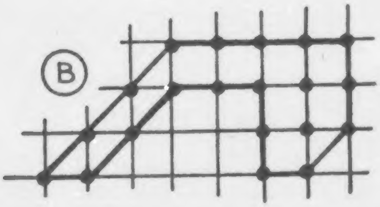
Ⓐ



i = ____
b = ____

Area = ______________________

Ⓑ

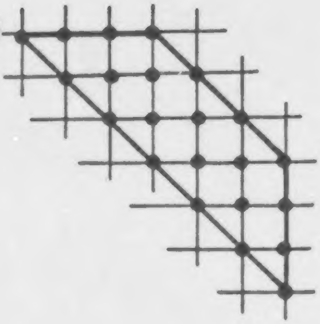


i = ____
b = ____

Area = ______________________

Figure 34

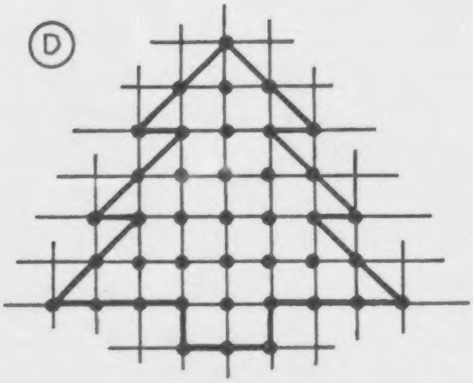
Ⓒ



i = ____
b = ____

Area = ____________________

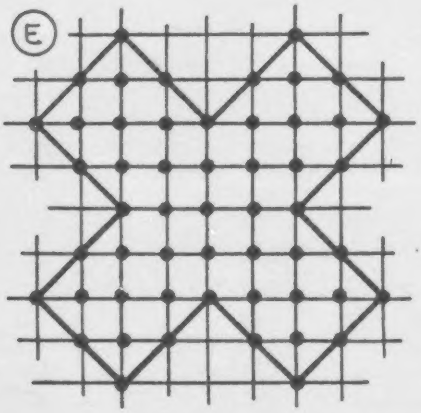
Ⓓ



i = ____
b = ____

Area = ____________________

Ⓔ



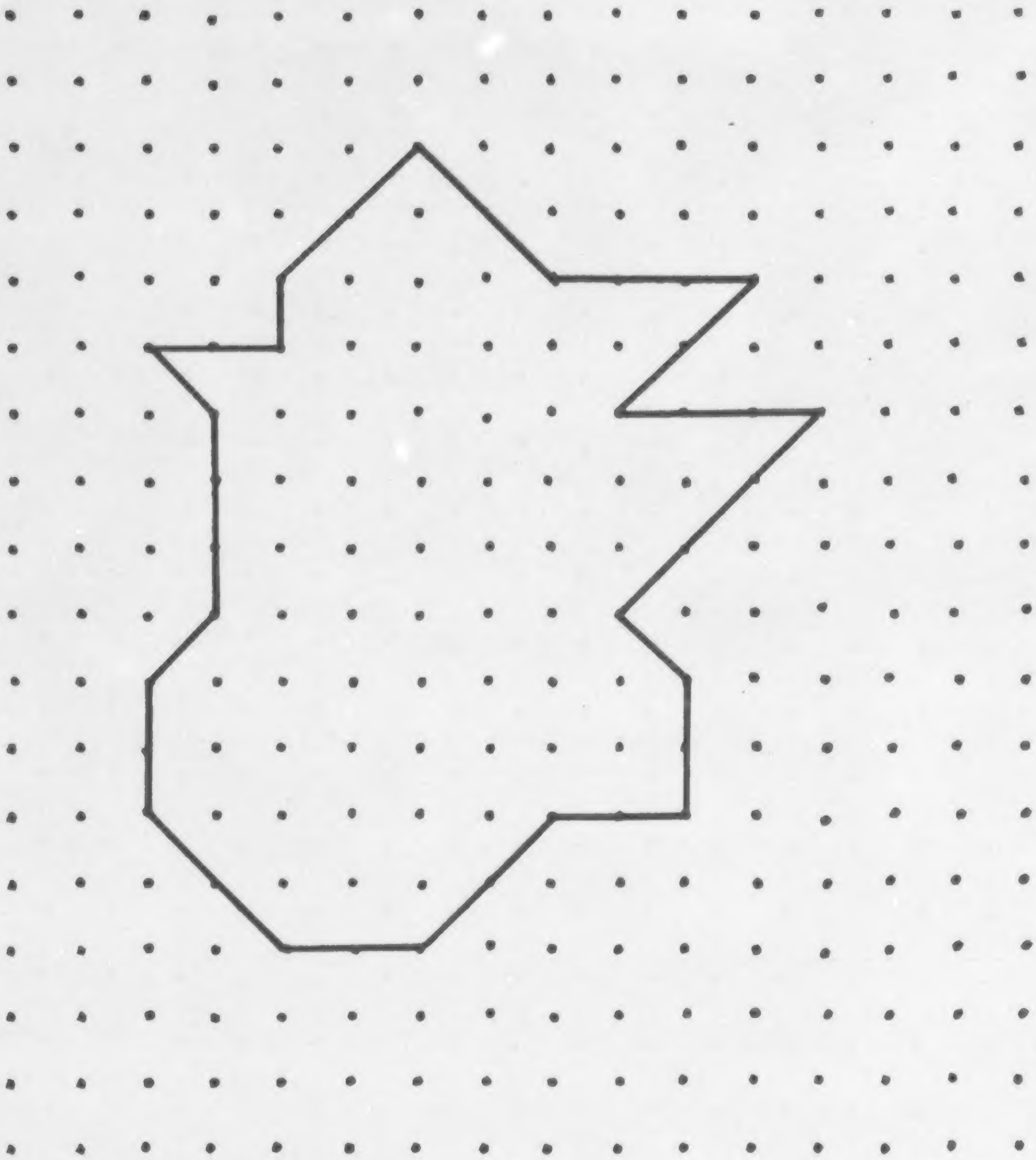
i = ____
b = ____

Area = ____________________

Figure 34 (contd.)

Unit IV, Lesson 5
Transparency

Figure 1



Unit IV, Lesson 5
Dot paper

Unit IV, Lesson 7 Name______________________________

Reading Guide Date______________________________

Open your book to page 114. Answer these questions as you read the example.

______________________________ 1. What is the problem about?

____

______________________________ 2. What information is given?

____

______________________________ 3. What are you to find?

____

______________________________ 4. a. What does t stand for?

______________________________ b. What does 15t stand for?

______________________________ c. What does 12t represent?

______________________________ 5. What equation was written to solve the problem?

______________________________ 6. What is the answer to the problem?

______________________________ 7. Does the answer check?

Now look at the example on page 115. As you read the problem, answer the following question:

______________________________ 1. What is the problem about?

____

______________________________ 2. What information is given?

____

______________________________ 3. What are you to find?

____

______________________________ 4. a. What does r stand for?

______________________________ b. What does r + 2 stand for?

______________________________ c. What does 2r represent?

______________________________ d. What does 2(r + 2) represent?

______________________________ 5. What equation was written to solve the problem?

______________________________ 6. What is the answer to the problem?

______________________________ 7. Does the answer check?

Unit IV, Lesson 8 Name______________________

Reading Guide Date______________________

Open your book to page 118. Answer these questions as you read the example.

______________________ 1. What is the problem about?

____

______________________ 2. What information is given?

____

______________________ 3. What are you to find?

____

______________________ 4. a. What does n represent?

______________________ b. What does n - 2 represent?

5. Look at the table:

______________________ a. What expression represents the selling price?

______________________ b. What expression represents the buying price?

______________________ 6. What is the profit?

______________________ 7. What equation was written to solve the problem?

______________________ 8. What is the answer?

______________________ 9. Does the answer check?

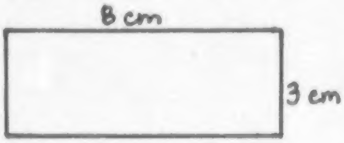
Unit IV Name________________________

Quiz 1 Date________________________

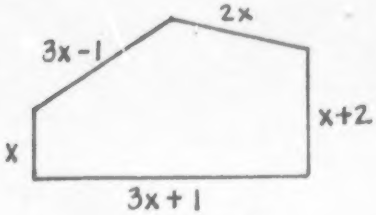
Show all written work on this quiz paper.

1. Find the perimeter of each figure below:

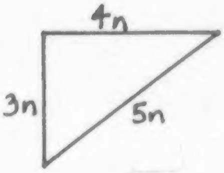
__________ a.



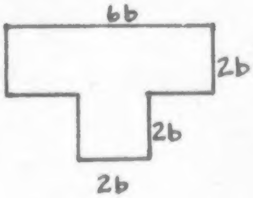
__________ b.



__________ c.



__________ d.



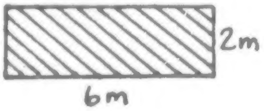
length = ______

width = ______

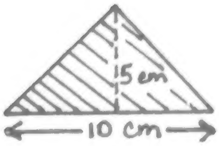
2. The length of a rectangle is 5 cm more than the width. The perimeter is 38 cm . Find the length and width of the rectangle.

3. Find the area of the shaded region.

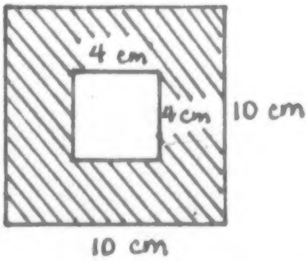
________ a.



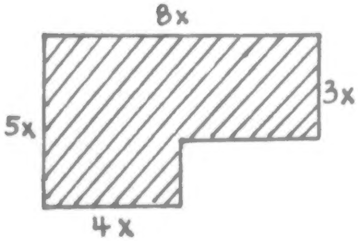
________ b.



________ c.



________ d.



Unit IV

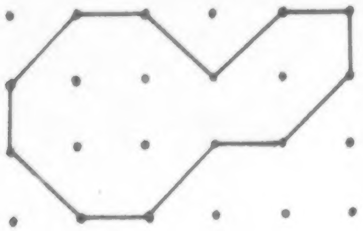
Quiz 2

Name______________________________

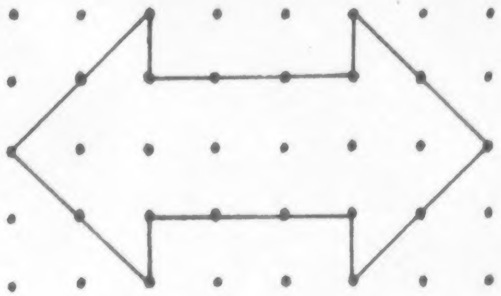
Date______________________________

1. Use Pick's Rule, area of a polygon = $i + \frac{b}{2} - 1$, where i is the number of interior dots and b is the number of boundary dots, to find the area of each figure below:

________ a.



________ b.



2. Find the length and the area of a rectangle given the following:

length = ______ a. Perimeter = 20 meters
area = ______ Width = 4 meters

length = ______ b. Perimeter = 17 meters
area = ______ Width = 2 meters

3. a. Make a table showing all the possible sizes of a rectangular pen built from 12 one-meter sections of fencing.

   b. What dimensions give the maximum area?

4. a. Make a table showing all the possible sizes of a rectangular pen built from 18 one-meter sections of fencing.

   b. What dimensions give the maximum area?

Unit IV

Quiz 3

Name______________________________

Date______________________________

Write the answers in the spaces provided.

__________ 1. You walk for 4 hours at y km/hr. Your distance D = ?

__________ 2. You buy k tickets at m dollars each. The cost C = ?

__________ 3. You make $140 per week. Your pay for x weeks is ?

__________ 4. You buy 2 packages of seeks at k cents each and 3 candy bars at m cents each. Total cost C = ?

For each of the following problems you are to do 3 things:

1. Complete the table.
2. Write the equation that will help you solve the problem.
3. Find the answer to the question.

5. Sal and Jim live 450 km apart.
They ride their motorcycles toward each other.
Sal travels at 88 km/h.
Jim travels at 62 km/h.
How long will it take them to meet?

Let t = number of hours until they meet.

	rate x time = distance		
Sal	88	t	88t
Jim			
			450

Equation: ____________________

Answer: ____________________

6. Peggy walks 2 km/h faster than Donna.
They walk in opposite directions for 3 hours.
They are 42 km apart. How fast do they walk?

Let r = Donna's speed
Then r + 2 = Peggy's speed

	rate x time = distance		
Donna	r	3	
Peggy	r+2		

Equation: ____________________

Answer: ____________________

Unit IV Test

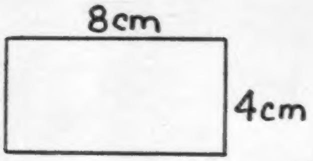
Name_______________________________

Date_______________________________

Show all your written work on the test papers. Place your answers in the spaces provided.

Find the perimeter and the area of each figure below.

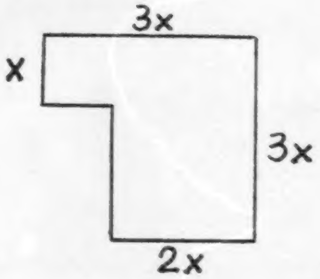
1.



Perimeter = __________

Area = __________

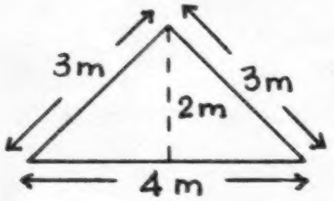
2.



Perimeter = __________

Area = __________

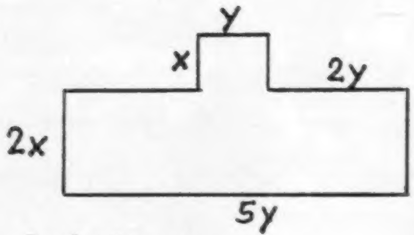
3.



Perimeter = __________

Area = __________

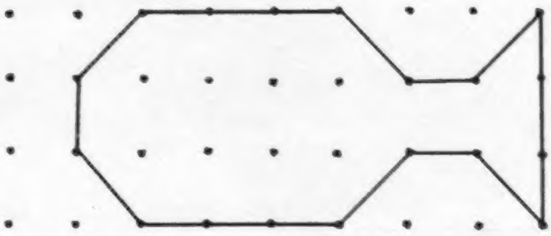
4.



Perimeter = __________

Area = __________

5. Use Pick's rule, area of a polygon = $i + \frac{b}{2} - 1$, where i is the number of interior dots and b is the number of boundary dots, to find the area of the figure.



Area = __________

(Go on to the next page.)

Length = ________

Area = ________

6. Find the length and the area of a rectangle, given that its perimeter is 26 meters and its width is 4 meters.

Length = ________

Width = ________

7. The length of a rectangle is 5 cm more than the width. The perimeter is 46 cm. Find the length and width of the rectangle.

____

8. It costs $7 per square meter to pave a driveway. How much will it cost to pave a driveway 10 meters long and 4 meters wide?

9. a. Make a table showing all the possible sizes of a rectangular pen built from 20 one-meter sections of fencing.

____

b. What dimensions give the maximum area?

10. Complete each of the following:

____

a. You travel at 80 km/hr for m hours. Your distance D = ?.

____

b. You buy 5 shakes at x cents each and 4 hamburgers at y cents each. The total cost C = ?.

11. The Sound Shop bought several stereo speakers at $80 each.
They kept 2 and sold the rest at $150 each.
Their profit was $1380.
How many speakers did they sell?

Let n = number of speakers bought

Equation: ________________

	price x number = cost		
Sell	150		
Buy		n	
			1380

Answer: ________

(Go on to the next page.)

12. Josie and Mario Lopez each earn $5 an hour at work.
One week Josie worked 8 hours more than Mario.
Their combined pay that week was $340.
How many hours did each person work?

Let x = number of hours Mario worked

	pay per hour x	number of hours =	weekly pay
Mario	5	x	
Josie			
			340

Equation: ____________________

Answer: __________

13. Sharon and Barney start at the same place.
They drive in opposite directions for 2 hours.
They are then 270 km apart.
Sharon's speed is 60 km/hr.
What is Barney's speed?

ANSWER KEY

Worksheet 1

1. 12 cm
2. 18 cm
3. 6 cm
4. 12 cm
5. 20 cm
6. 8 cm
7. 14 cm
8. 14 cm
9. 20 cm
10. 22 cm

Worksheet 2

1. 4 cm^2
2. 16 cm^2
3. 36 cm^2
4. 12 cm^2
5. 10 cm^2
6. 36 cm^2
7. 4 cm^2
8. 9 cm^2
9. 16 cm^2
10. 14 cm^2

Worksheets 3a - b

1. length = 10 m
   area = 20 m^2
2. length = 5 m
   area = 20 m^2
3. length = 6 m
   area = 12 m^2
4. length = 3 m
   area = 21 m^2
5. length = 4.5 m
   area = 9 m^2
6. length = 3 m
   area = 12 m^2

7.

Length	Width	Area
5	1	5
4	2	8
3	3	9
2	4	8
1	5	5

maximum area = 9 m^2

dimensions are 3 m by 3 m

	Perimeter	Length	Width	Area
	20	6	4	24
8.	22	7	4	28
9.	26	8	5	40
10.	36	12	6	72
11.	38	16	3	48
12.	30	8	7	56
13.	28	5	9	45
14.	13	3.5	3	10.5
15.	17	5	3.5	17.5

16.

l	*w*	*A*
11	1	11
10	2	20
9	3	27
8	4	32
7	5	35
6	6	36
5	7	35
4	8	32
3	9	27
2	10	20
1	11	11

6 m by 6 m

(Go on to the next page.)

17.

l	w	A
13	1	13
12	2	24
11	3	33
10	4	40
9	5	45
8	6	48
7	7	49
6	8	48
5	9	45
4	10	40
3	11	33
2	12	24
1	13	13

7 m by 7 m

18.

l	w	A
15	1	15
14	2	28
13	3	39
12	4	48
11	5	55
10	6	60
9	7	63
8	8	64
7	9	63
6	10	60
5	11	55
4	12	48
3	13	39
2	14	28
1	15	15

8 m by 8 m

19. a square

20. 2 m by 3 m

21. 4 m by 4 m

22. 5 m by 5 m

23. 7 m by 8 m

24.

l	w	A
6	1	6
5	2	10
4	3	12
3	4	12
2	5	10
1	6	6

3 m by 4 m

Worksheets 4a - e

2. a.

Fig.	Interior Dots (i)	Boundary Dots (b)	Area
B	0	4	1 sq. unit
C	0	5	1-1/2 sq. units
D	0	6	2 sq. units
E	0	7	2-1/2 sq. units
F	0	8	3 sq. units
G	0	9	3-1/2 sq. units

b. 0

c. $\frac{1}{2}$

d. d.

3. a.

Fig.	Interior Dots (i)	Boundary Dots (b)	Area
B	1	4	2 sq. units
C	1	5	2-1/2 sq. units
D	1	6	3 sq. units
E	1	7	3-1/2 sq. units
F	1	8	4 sq. units

b. $\frac{1}{2}$

c. Yes

d. 3

e. e.

4. a.

Fig.	Interior Dots (i)	Boundary Dots (b)	Area
B	2	7	4-1/2 sq. units
C	2	8	5 sq. units
D	2	9	5-1/2 sq. units
E	2	10	6 sq. units

b. Yes

c. $2 + \frac{b}{2} - 1$;

$3 + \frac{b}{2} - 1$

5. $A = i + \frac{b}{2} - 1$

6. a. i = 0; b = 14; A = 6 sq. units
   b. i = 2; b = 18; A = 10 sq. units
   c. i = 7; b = 15; A = 13-1/2 sq. units
   d. i = 14; b = 26; A = 26 sq. units
   e. i = 29; b = 24; A = 40 sq. units

(Go on to the next page.)

Quiz 1

1. a. 22 cm b. $10x + 2$ c. $12n$ d. $20b$
2. length = 12 cm , width = 7 cm
3. a. 12 m^2 b. 25 cm^2 c. 84 cm^2 d. $32x^2$

Quiz 2

1. a. 10 square units b. 14 square units
2. a. length = 6 m , area = 24 m^2
   b. length = 6.5 m , area = 13 m^2
3. a.

ℓ	w	A
5	1	5
4	2	8
3	3	9
2	4	8
1	5	5

b. 3 m by 3 m

4. a.

ℓ	w	A
8	1	8
7	2	14
6	3	18
5	4	20
4	5	20
3	6	18
2	7	14
1	8	8

b. 5 m by 4 m

Quiz 3

1. $4y$ 2. km 3. $140x$ 4. $2k + 3m$

5.

	rate x time = distance		
Sal	88	t	88t
Jim	62	t	62t
			450

Equation: $88t + 62t = 450$
$150t = 450$
$t = 3$
Answer: 3 hours

6.

	rate x time = distance		
Donna	r	3	3r
Peggy	r+2	3	3(r + 2)
			42

Equation: $3r + 3(r + 2) = 42$
$3r + 3r + 6 = 42$
$6r + 6 = 42$
$6r = 36$
$r = 6$

Answer: Donna's speed is 6 km/hr
Peggy's speed is 8 km/hr

Unit IV Test

1. Perimeter = 24 cm
   Area = 32 cm^2
2. Perimeter = $12x$
   Area = $7x^2$
3. Perimeter = 10 m
   Area = 4 m^2
4. Perimeter = $6x + 10y$
   Area = $11xy$

(Go on to the next page.)

5. Area = 16 square units

6. Length = 9 m
Area = 36 m^2

7. Length = 14 cm
Width = 9 cm

8. \$280

9. a.

ℓ	w	Area
9	1	9
8	2	16
7	3	21
6	4	24
5	5	25
4	6	24
3	7	21
2	8	16
1	9	9

b. 5 m by 5 m

10. a. 80 m

b. 5x + 4y

11.

	price x number = cost		
Sell	150	n - 2	150(n - 2)
Buy	80	n	80n
			1380

b. Equation: $150(n - 2) - 80n = 1380$

Answer: 22 speakers sold

12.

	pay per hour x number of hours = weekly pay		
Mario	5	x	5x
Josie	5	x + 8	5(x + 8)
			340

Equation: $5x + 5(x + 8) = 340$

Answer: Mario worked 30 hours, Josie worked 38 hours

13. Let x = Barney's speed

	rate x time = distance		
Sharon	60	2	120
Barney	x	2	2x
			270

$$\begin{aligned} 120 + 2x &= 270 \\ 2x &= 150 \\ x &= 75 \end{aligned}$$

Barney's speed is 75 km/hr

Unit V

Lesson 1: Addition, pgs. 136 - 137

Vocabulary: polynomials, monomial, binomial, trinomial

Comments: Read T67 - T68

Discuss the answers to the Classroom Practice Exercises. Review more problems, if necessary.

Students are introduced to many new terms: polynomial, monomial, binomial, and trinomial. Encourage students to use them when communicating.

Suggested Assignments: Written Exercises 1 - 26, pg. 137

Lesson 2: Subtraction, pgs. 138 - 139

Comments: Read T68

Be sure to remind students that to find the opposite of a polynomial with more than one term, take the opposite of each term of the polynomial.

Review a number of problems as a class and discuss the steps for doing each problem carefully.

Suggested Assignments: Written Exercises 1 - 25, pg. 139
Self-Test, pg. 139

QUIZ I Anytime after Lesson 2

Lesson 3: Multiplying Monomials, pgs. 140 - 141

Comments: Read T68 - T69

Be sure to point out that the rule "$x^a \cdot x^b = x^{a+b}$" works only for powers of the same number. An expression like x^5y^7 cannot be simplified.

Suggested Assignments: Written Exercises 1 - 28, pg. 141
Puzzles and Things, pg. 141

Lesson 4: Powers of Monomials, pgs. 142 - 143

Comments: Read T69

STUDY PATTERNS

Have students study examples to discover the rules:

$$(x^a)^b = x^{ab} \quad \text{and} \quad (xy)^n = x^n y^n$$

Suggested Assignments: Written Exercises 1 - 27, pg. 143

Lesson 5: Polynomials Times Monomials, pgs. 144 - 145

Comments: Read T69 - T70

Suggested Assignments: Written Exercises 1 - 22, 24 - 32 (evens), pg. 145
Self-Test, pg. 145

QUIZ 2 Anytime after Lesson 5

Lesson 6: Multiplying Polynomials, pgs. 146 - 147

Comments: Read T70

Students should be instructed to rewrite the exercises in this section in the vertical form. Discuss with the students step by step how to use the vertical form for multiplying by a binomial.

Suggested Assignments: Written Exercises 1 - 28, pg. 147

Lesson 7: Multiplying at Sight, pgs. 148 - 151

Comments: Read T71

Suggested Assignments: Written Exercises 1 - 35, pg. 150

Lesson 8: Square of a Binomial, pgs. 152 - 153

Vocabulary: trinomial square

Comments: Read T71 - T72

PHYSICAL MODEL

Be sure to discuss Exercise 37 on page 153 as a class. A physical model for squaring a binomial is shown.

Suggested
Assignments: Written Exercises 1 - 37, pg. 153
Self-Test, pg. 153

QUIZ 3 Anytime after Lesson 8

Lesson 9: Division with Monomials, pgs. 154 - 155

Comments: Read T72 - T73

Suggested
Assignments: Written Exercises 1 - 24, pg. 155

Lesson 10: Career Notebook, pg. 163
Consumer Corner, pgs. 164 - 165
Reviewing the Chapter, pgs. 166 - 167

Comments: Discuss the Career Notebook and Consumer Corner as a class. You may want to ask students to bring in items for price comparison.

Suggested
Assignments: Reviewing the Chapter Exercises 1 - 44, pg. 166

Lesson 11: Reviewing the Chapter, pgs. 166 - 167

Suggested
Assignments: Exercises 45 - 78, pg. 167

Lesson 12: Review

Suggested
Assignments: Reviewing Arithmetic Skills, pg. 162

Lesson 13: Unit V Test

Suggested
Assignments: Read pgs. 170 - 171
Written Exercises 1 - 10, pg. 171

Unit V   Name ____________________

Quiz 1   Date ____________________

Add or subtract. Place your answers in the space provided.

1. $$\begin{array}{r} 4x^2 + 5x - 8 \\ +\ 3x^2 - 5x + 21 \\ \hline \end{array}$$

____

2. $$\begin{array}{r} 14mn + n^2 \\ +\ {}^{-}3mn + n^2 \\ \hline \end{array}$$

____

3. $$\begin{array}{r} a^2 - 3ab - 9b^2 \\ -\ (2a^2 - 4ab - 10b^2) \\ \hline \end{array}$$

____

4. $$\begin{array}{r} c^2 - 9d^2 \\ -\ (c^2 + 9d^2) \\ \hline \end{array}$$

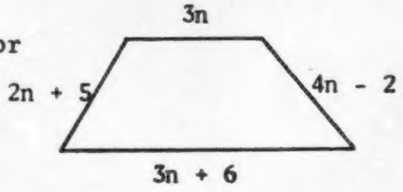
____

________________ 5. $(5y + 6) + (3y - 4)$

________________ 6. $(3m^2 - 6m + 5) - (m^2 - 4m + 7)$

________________ 7. $(2y^2 + y - 1) - (y^2 - 4y - 2)$

________________ 8. Write an expression for the perimeter of the figure on the right.



Solve each equation below.

________________ 9. $5x - (2x + 3) = 12$

________________ 10. $(3n - 5) - (n - 7) = 26$

Unit V - Quiz 2

Name ______________________

Multiply.

______ 1. $(3x^2)(2x^4)$

______ 2. $(8cd)(^{-}2c^2d^2)$

______ 3. $2(m^2 + n^2)$

______ 4. $^{-}4(a - 2c)$

______ 5. $3a(2a - 5)$

______ 6. $2c(4c^2 - 5c + 3)$

______ 7. $^{-}3y(x^2y^2 - 2xy + 1)$

Simplify.

______ 8. $(a^2b)^3$

______ 9. $(n^4)^5$

______ 10. $(^{-}2x^3)^3$

Unit V - Quiz 3

Name ______________________

Multiply.

______ 1. $(a + 5)(a + 4)$

______ 2. $(m - 6)(m - 2)$

______ 3. $(n + 5)(n - 3)$

______ 4. $(y - 6)(y + 1)$

______ 5. $(2x + 3)(x + 1)$

______ 6. $(2m - 1)(3m + 2)$

Express as a trinomial.

______ 7. $(m + 4)^2$

______ 8. $(3x - 1)^2$

______ 9. $(c - 5)^2$

______ 10. $(2a + 3b)^2$

Unit V Test

Name ________________________

Show all your written work on the test papers. Place your answer in the space provided.

Add.

1. $$\begin{array}{r} 3x + 5 \\ +\ \ 4x + 6 \\ \hline \end{array}$$

____

2. $$\begin{array}{r} 5a^2b - 3ab^2 \\ +\ \ 7a^2b - 9ab^2 \\ \hline \end{array}$$

____

3. $$\begin{array}{r} n^2 - 2n - 3 \\ + {-n^2} - 8n + 2 \\ \hline \end{array}$$

____

________ 4. $(6a^2 + 2a - 1) + (a^2 - 3a - 7)$

________ 5. $(3x^4 - 2x^2 - 4) + (6x^4 - 3x^2 + 7)$

Subtract.

6. $$\begin{array}{r} 2y - 3 \\ -\ (3y + 2) \\ \hline \end{array}$$

____

7. $$\begin{array}{r} a^2 - 3ab - 9b^2 \\ -\ \ (2a^2 - 4ab - 10b^2) \\ \hline \end{array}$$

____

________ 8. $(^{-}2x + 4) - (x + 2)$

________ 9. $(4x^2 + x - 1) - (5x^2 + x + 1)$

Simplify.

________ 10. $(n^4)^5$ ________ 11. $(2m^4)^3$ ________ 12. $(^{-}3xy)^2$

(Go on to the next page.)

Unit V Test - Page 2

Multiply.

__________ 13. $c^4 \cdot c^7$

__________ 14. $({}^{-}3x^2)(2x^4)$

__________ 15. $({}^{-}5a^2b)({}^{-}7ab)$

__________ 16. $6(x - y)$

__________ 17. ${}^{-}4d(3d - d^2)$

__________ 18. $(y - 6)(y + 1)$

__________ 19. $(2x + 3)(x - 9)$

__________ 20. $(w - 5)(w - 8)$

Express as a trinomial.

__________ 21. $(a + 7)^2$

__________ 22. $(4x - 2)^2$

Divide.

__________ 23. $\frac{10x^8}{5x^4}$

__________ 24. $\frac{14m^3n^4}{{}^{-}2n^2}$

__________ 25. $\frac{{}^{-}36ab^2}{{}^{-}9a}$

__________ 26. $\frac{{}^{-}24x^5y^5}{8xy^2}$

(Go on to the next page.)

Solve each equation.

__________ 27. $(3x - 7) - (x - 4) = 9$

__________ 28. $(7m - 11) - (3m - 8) = 25$

__________ 29. A rectangle measures $(2a + 5)$ centimeters by $(a - 2)$ centimeters. Find its area.

Unit V ANSWER KEY

Quiz 1

1. $7x^2 + 13$
2. $11mn + 2n^2$
3. $-a^2 + ab + b^2$
4. $^-18d^2$
5. $8y + 2$
6. $2m^2 - 2m - 2$
7. $y^2 + 5y + 1$
8. $12n + 9$
9. $x = 5$
10. $n = 12$

Quiz 2

1. $6x^6$
2. $^-16c^3d^3$
3. $2m^2 + 2n^2$
4. $^-4a + 8c$
5. $6a^2 - 15a$
6. $8c^3 - 10c^2 + 6c$
7. $^-3x^2y^3 + 6xy^2 - 3y$
8. a^6b^3
9. n^{20}
10. $^-8x^9$

Quiz 3

1. $a^2 + 9a + 20$
2. $m^2 - 8m + 12$
3. $n^2 + 2n - 15$
4. $y^2 - 5y - 6$
5. $2x^2 + 5x + 3$
6. $6m^2 + m - 2$
7. $m^2 + 8m + 16$
8. $9x^2 - 6x + 1$
9. $c^2 - 10c + 25$
10. $4a^2 + 12ab + 9b^2$

Unit Test

1. $7x + 11$
2. $12a^2b - 12ab^2$
3. $^-10n - 6$
4. $7a^2 - a - 8$
5. $9x^4 - 5x^2 + 3$
6. $^-1y - 5$
7. $^-1a^2 + ab + b^2$
8. $^-3x + 2$
9. $^-1x^2 - 2$
10. n^{20}
11. $8m^{12}$
12. $9x^2y^2$
13. c^{11}
14. $^-6x^6$
15. $35a^3b^2$
16. $6x - 6y$
17. $^-12d^2 + 4d^3$
18. $y^2 - 5y - 6$
19. $2x^2 - 15x - 27$
20. $w^2 - 13w + 40$
21. $a^2 + 14a + 49$
22. $16x^2 - 16x + 4$
23. $2x^4$
24. $^-7m^3n^2$
25. $4b^2$
26. $^-3x^2y$
27. $x = 6$
28. $m = 7$
29. $2a^2 - a - 10$

Unit VI (Optional)

Lesson 1: Factoring in Arithmetic, pgs. 170 - 171

Vocabulary: prime number, prime factors, common factor, greatest common factor

Comments: Read T75 - T76

Suggested Assignments: Written Exercises 11 - 38 , pg. 171

Lesson 2: Common Monomial Factors, pgs. 172 - 173

Vocabulary: factor the polynomial, common monomial factor

Comments: Read T76

Suggested Assignments: Written Exercises 1 - 28 , pg. 173

Lesson 3: Review

Suggested Assignments: Exercises 1 - 31, top section of page 419

Lesson 4: Unit VI Test

Suggested Assignments: Read pages 204 - 205
Do Classroom Practice, page 205

Unit VI Test Name ______________________________

Show all your written work on the test papers. Place your answer in the space provided.

Find the prime factors.

__________ 1. 12

__________ 2. 45

__________ 3. 72

Find the greatest common factor of the pair of numbers.

__________ 4. 10 , 15

__________ 5. 27 , 18

__________ 6. 14 , 35

__________ 7. $8x^3$, $4x$

__________ 8. $6y$, $9y$

__________ 9. $15ab$, $25a^2b$

__________ 10. $20m^2$, $10m^2n$

Factor.

__________ 11. $2x + 4$

__________ 12. $4a^2 - 12a$

__________ 13. $m^2 - 5m$

__________ 14. $2y^2 - 10y^4$

__________ 15. $5a^3 + 5a^2$

__________ 16. $5a^2 - 15a$

__________ 17. $28x^2 - 7x$

__________ 18. $11a^2 - 22a^2b$

__________ 19. $2a^2 - 4ab + 6b^2$

__________ 20. $5x^3 + 10x^2 + 20x$

Unit VI

ANSWER KEY

Unit VI Test

1. $2^2 \cdot 3$
2. $3^2 \cdot 5$
3. $2^3 \cdot 3^2$
4. 5
5. 9
6. 7
7. $4x$
8. $3y$
9. $5ab$
10. $10m^2$
11. $2(x + 2)$
12. $4a(a - 3)$
13. $m(m - 5)$
14. $2y^2(1 - 5y^2)$
15. $5a^2(a + 1)$
16. $a(8a - 15)$
17. $7x(4x - 1)$
18. $11a^2(1 - 2b)$
19. $2(a^2 - 2ab + 3b^2)$
20. $5x(x^2 + 2x + 4)$

Unit VII: Graphs

Lesson 1: Graphs You Often See, pgs. 204 - 207

Vocabulary: graph, pictograph, bar graph

Comments: Read T83 - T84

Start the lesson with a class discussion on the graphs (page 204) and on the Classroom Practice exercises 1-5. Then have a discussion on the chalkboard example (page T83). (An overhead transparency master is provided.)

Have the students discuss why the graph on page 205 is misleading. As stated on page T83, be sure to point out that the scale on a graph should always start at zero. If this would cause the graph to be too large, a portion of the scale should be deleted and the deletion should be indicated by a jagged rule (see the first graph on page 206).

Suggested Assignments: Written Exercises 1 - 11, pages 206 - 207
Collect 2 examples of graphs from newspapers or magazines

Lesson 2: Graphs with Lines and Curves, pgs. 208 - 211

Vocabulary: broken line graph

Comments: Read T84

Present the data below to the students and ask them to draw a bar graph:

WASH-A-THON EARNINGS

YEAR	DOLLARS EARNED
1971	$460
1972	$480
1973	$492
1974	$508
1975	$525
1976	$537

Next show the class how a broken line graph can be drawn from the bar graph and then how a "smooth" line graph can be drawn. Discuss with the students how the three graphs are related and why we can draw a smooth curve in the third graph.

Have the students refer to the graphs to answer the following questions:

1) How much more money was collected in 1976 than in 1971?

2) Predict the amount of money that might be collected in 1977.

3) Predict the amount of money that might be collected in 1980.

(Overhead transparency masters are provided for this discussion.)

Suggested Assignments: Written Exercises 1 - 15, pgs. 209 - 210

Lesson 3: Graphs with Lines and Curves (continue)

Suggested Assignments: Written Exercises 16 - 28, pgs. 210 - 211

QUIZ I Anytime after Lesson 3

Lesson 4: Points on a Graph, pgs. 212 - 215

Vocabulary: point, horizontal axis, vertical axis, origin, coordinates, plot, locate

Comments: Read T85

The temperature data below may be used to introduce graphing points on a coordinate plane as on page 212.

Time in Hours Past Noon	Temp. °C
1	4.5°
2	5°
3	4.75°
4	4°
5	2°
6	0°
7	-1°
8	-2°

Overhead transparency masters for the above and the chalkboard examples are provided. Be sure to encourage verbal communication.

Suggested Assignments: Written Exercises 1 - 28, pgs. 214 - 215
Self-Test, pg. 215

Lesson 5: Solution Pairs, pgs. 216 - 219

Vocabulary:	solution pair, ordered pair
Comments:	Read T85 - T86 Be sure to stress that in an ordered pair of numbers, the x value is first and y value is second. Also, be sure to point out that (2,4) and (4,2) are different solutions. Have the students discuss the chalkboard examples on page T86. For Problem 4, explain to the students that it may be easier to solve for y before they begin to look for solution pairs.
Suggested Assignments:	Written Exercises 1 - 42, pgs. 218 - 219

Lesson 6: Graphs of Equation, pgs. 220 - 221

Vocabulary:	the graph of the equation
Comments:	Read T86 Start the lesson as suggested on T86. Then review the chalkboard examples. Overhead transparency masters are provided as well as graph paper masters.
Suggested Assignments:	Written Exercises 2 - 20 (evens), pg. 221 Written Exercises 22 - 24, pg. 221

QUIZ 2 Anytime after Lesson 6

Lesson 7: Looking at Graphs (supplement)

Comments:	Have the students make tables of ordered pairs before graphing. Have the students discuss the results.
Suggested Assignments:	Worksheets 1a - c Reviewing the Chapter 1 - 8, pg. 232

Lesson 8: Non-Linear Graphs (supplement)

Comments:	Have the students work in pairs to do the activities. Provide time for the students to discuss their results.
Suggested Assignments:	Worksheets 2 - 3 Reviewing the Chapter, 9 - 18, pgs. 232 - 233

Lesson 9: Reviewing Arithmetic Skills, pg. 228
Career Notebook, pg. 229
Consumer Corner, pgs. 230 - 231

Comments: Have the students start the Consumer Corner in class.

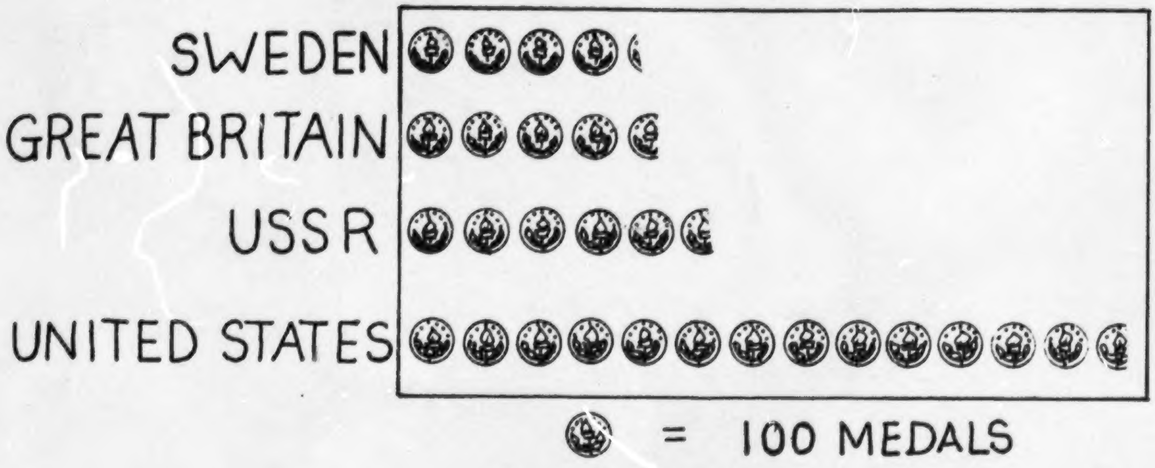
Suggested Assignments: Reviwing Arithmetic Skills 1 - 45 (odds)
Consumer Corner (all)

Lesson 10: Review

Suggested Assignment: Review for the test

Lesson 11: Unit VII Test

NUMBER OF OLYMPIC MEDALS WON 1896-1972



______________________ 1. What information does the graph show?

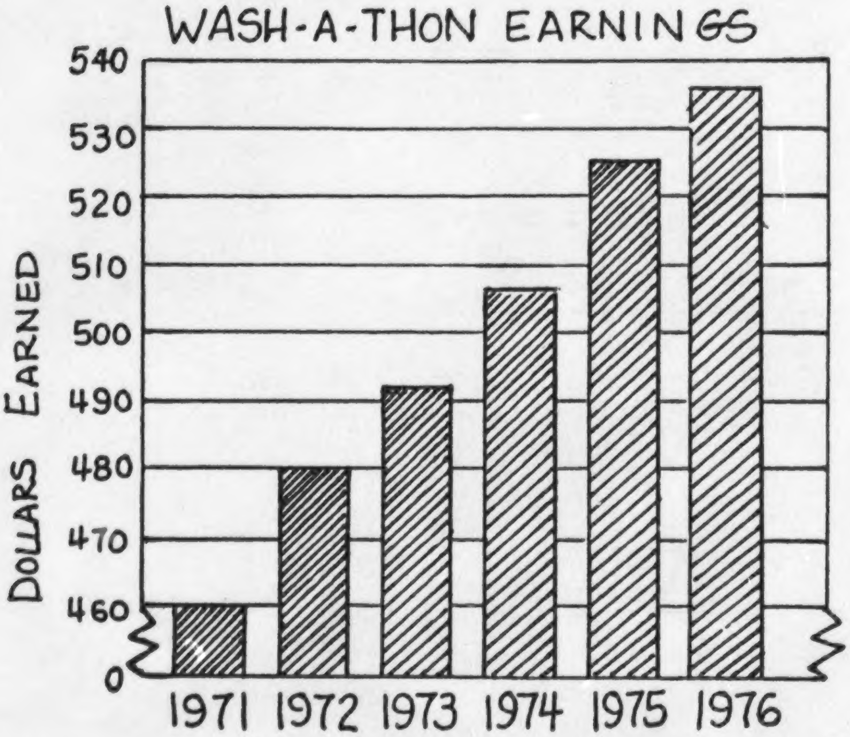
______________________ 2. How many medals does each symbol represent?

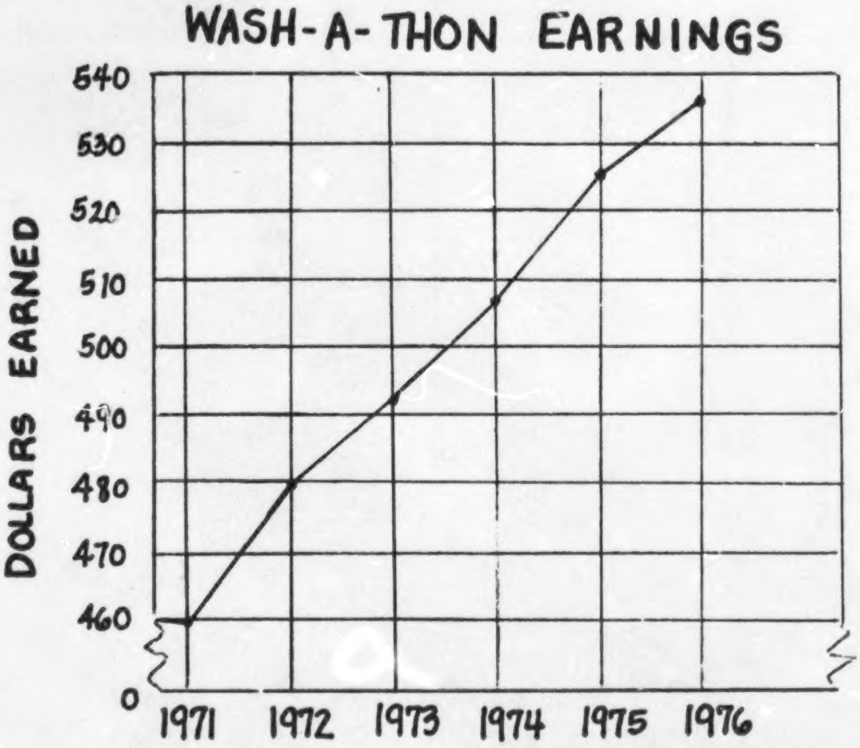
______________________ 3. What does a portion of a symbol stand for?

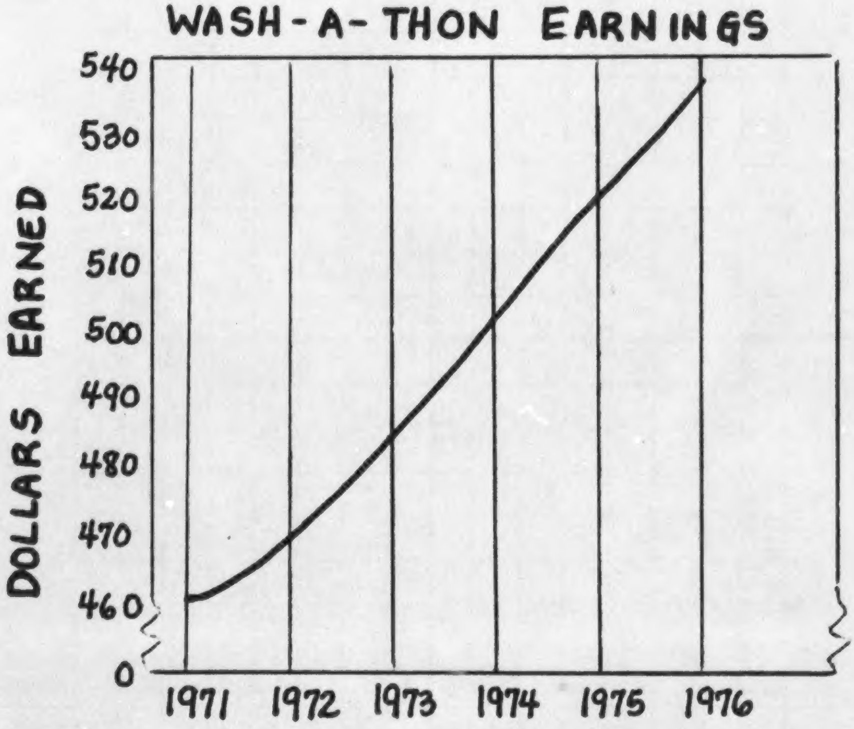
______________________ 4. About how many medals did Sweden win?

______________________ 5. Draw a bar graph that shows the same information.

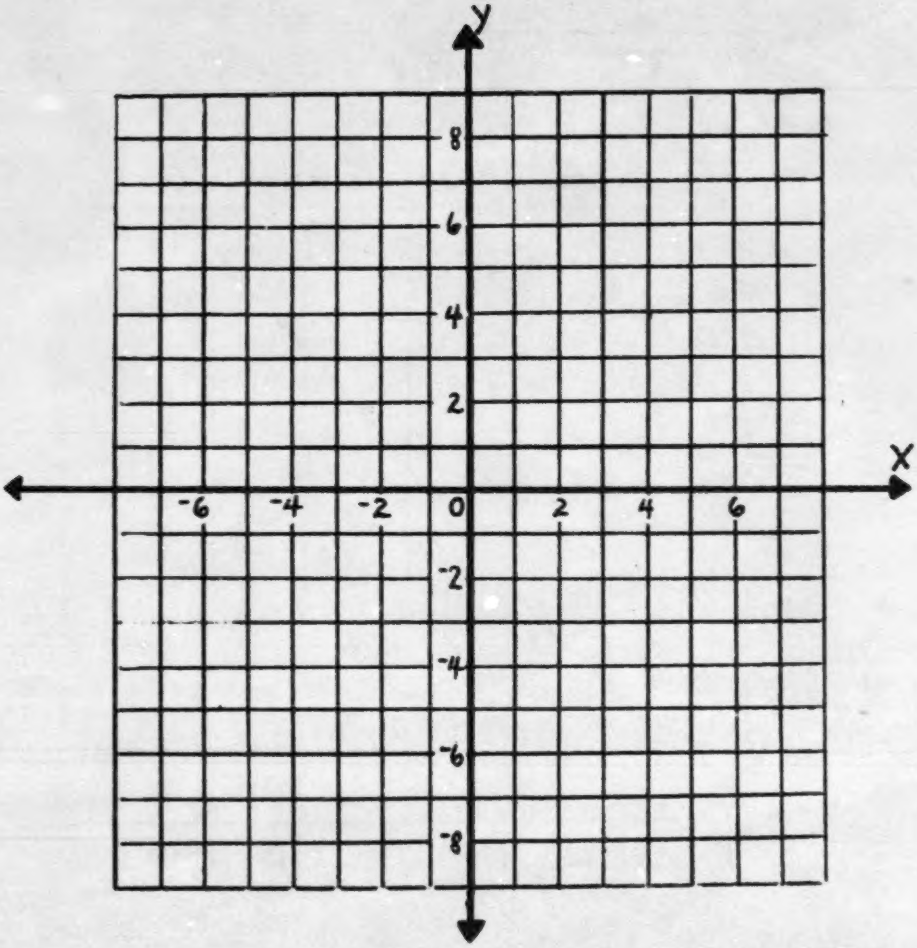
WASH-A-THON EARNINGS	
YEAR	DOLLARS EARNED
1971	$ 460
1972	$ 480
1973	$ 492
1974	$ 508
1975	$ 525
1976	$ 537

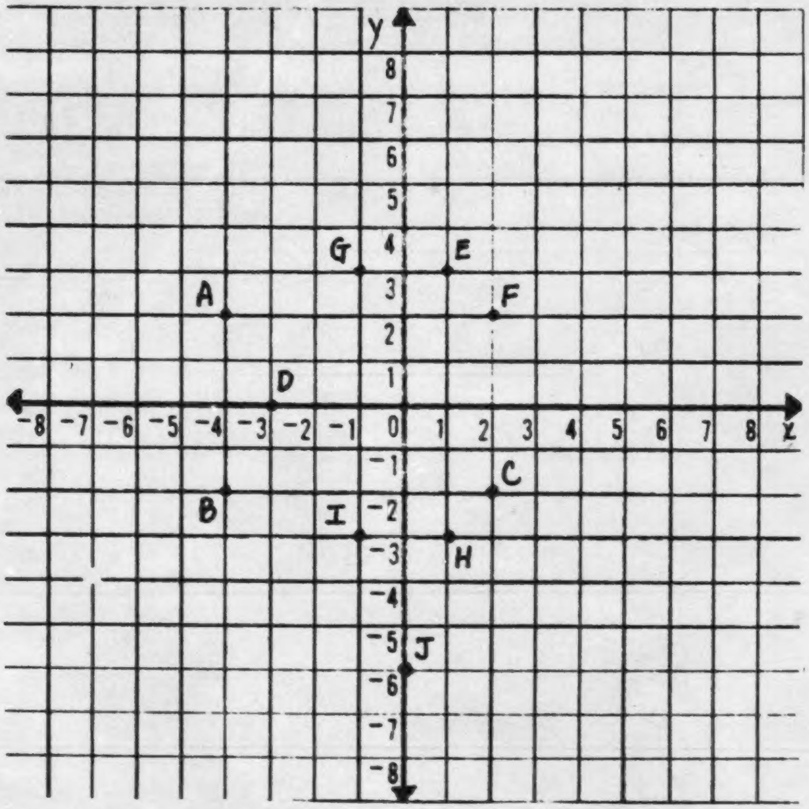



WASH-A-THON EARNINGS
DOLLARS EARNED
540
530
520
510
500
490
480
470
460
0
1971
1972
1973
1974
1975
1976


WASH-A-THON EARNINGS
DOLLARS EARNED
540
530
520
510
500
490
480
470
460
0
1971
1972
1973
1974
1975
1976

Time in Hours Past Noon	Temp. °C
1	4.5°
2	5°
3	4.75°
4	4°
5	2°
6	0°
7	$^-1$°
8	$^-2$°





Give the coordinates of each point.

1. A 2. C 3. D

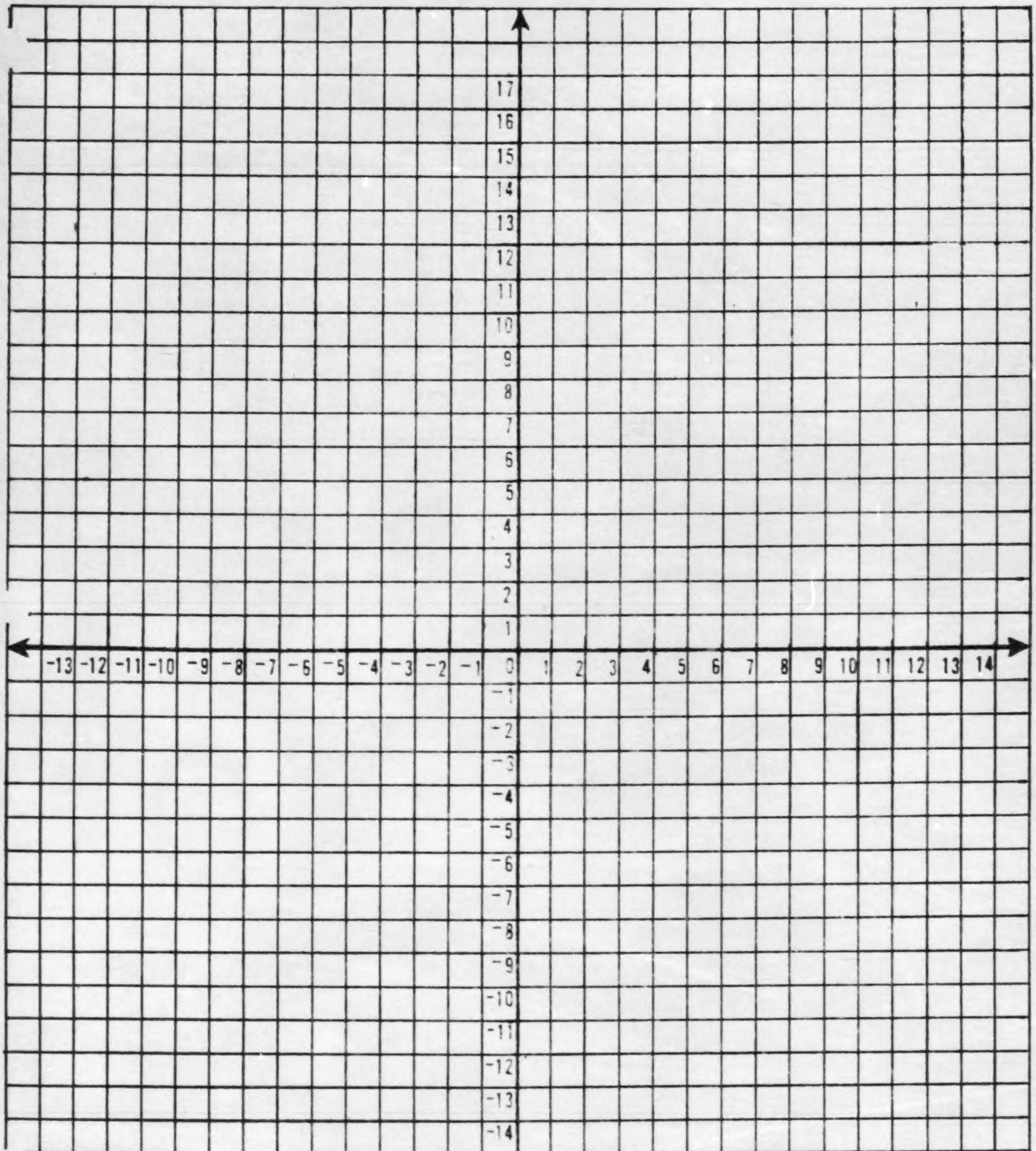
Name the point by its letter.

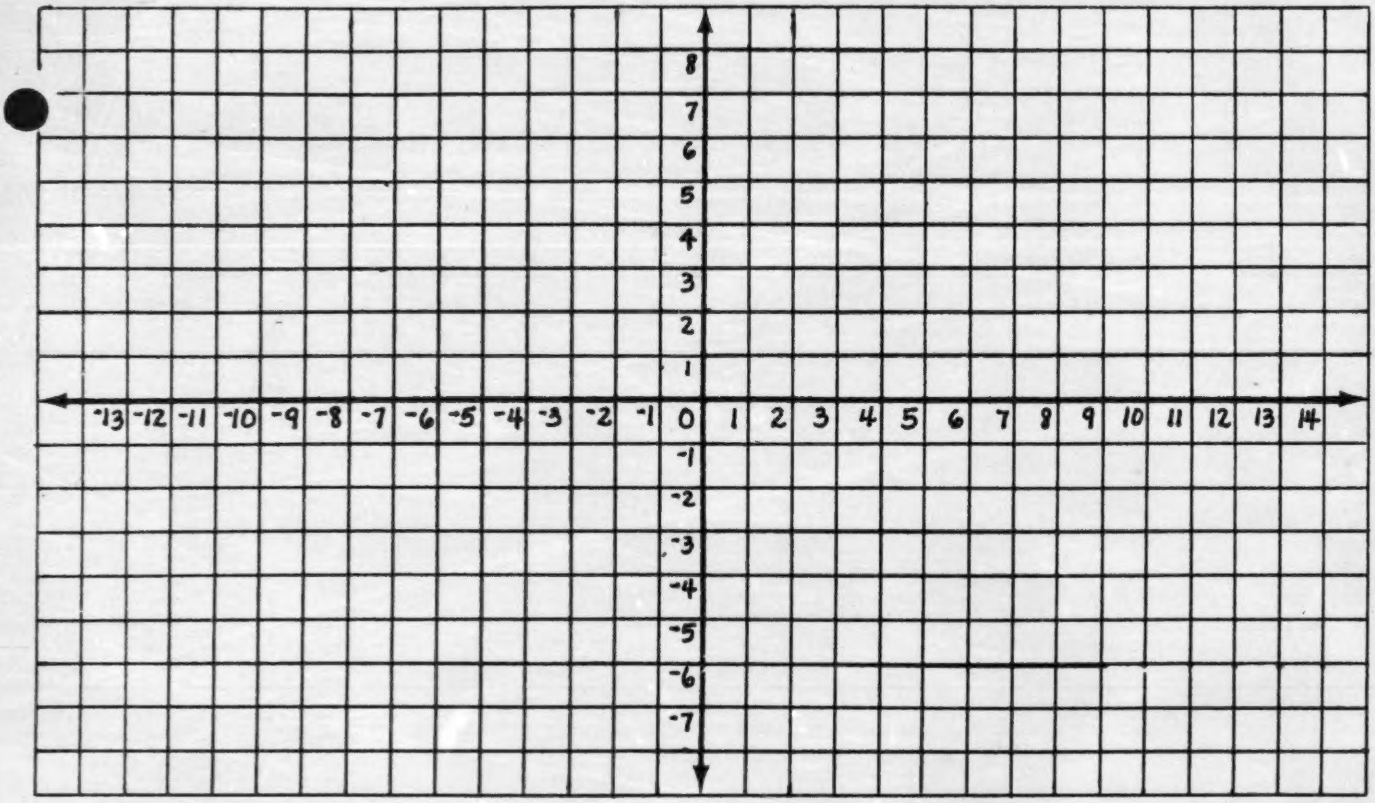
4. (1,3) 5. (¯1,3) 6. (¯1,¯3)

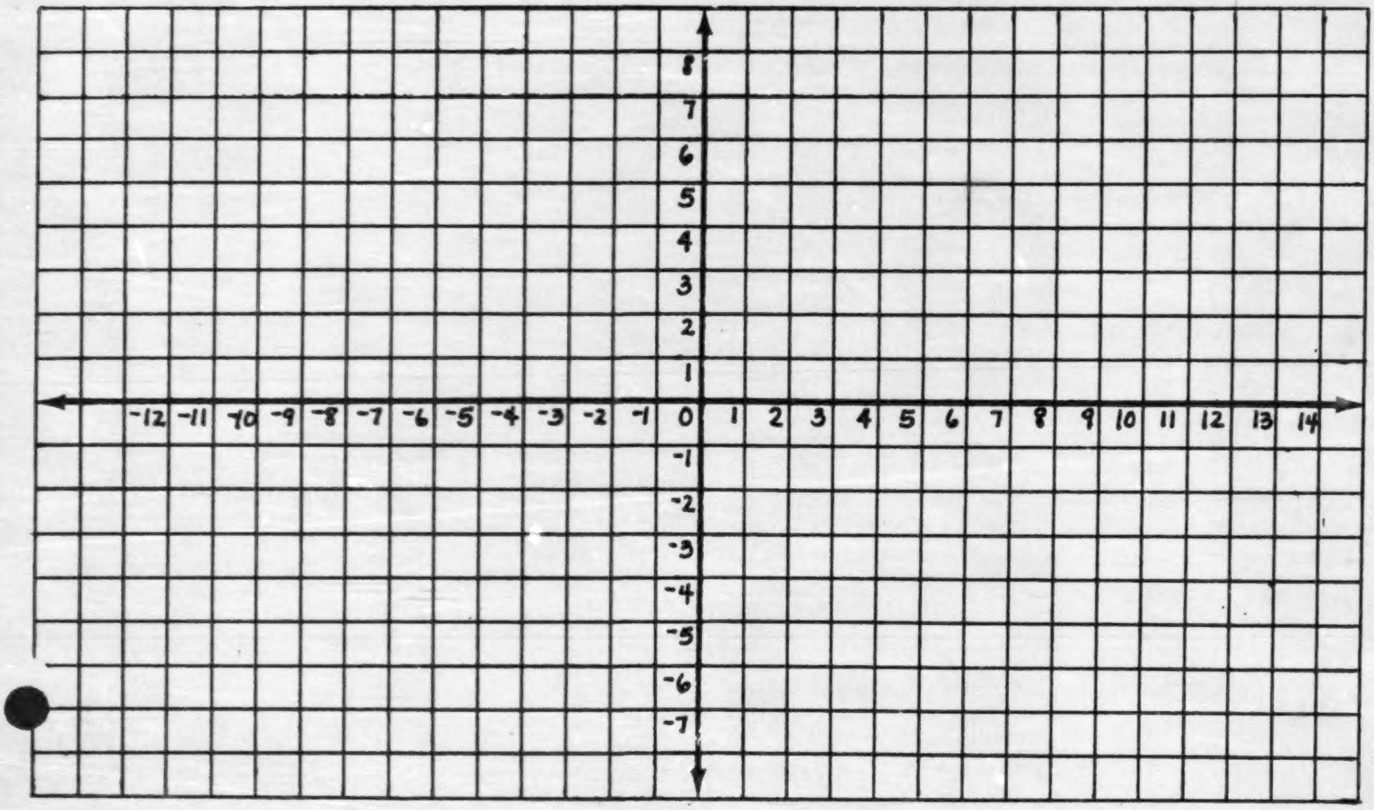
Give the coordinates of the point closest to each point.

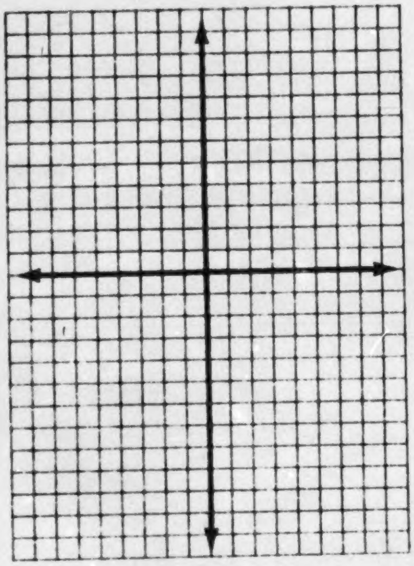
7. F 8. G 9. H

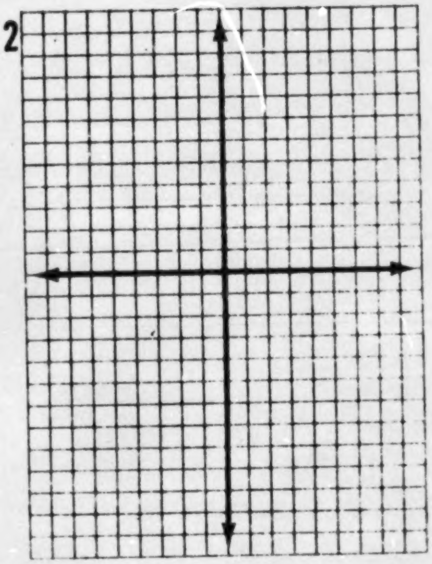
10. Name 4 points that are at the vertices of a rectangle.

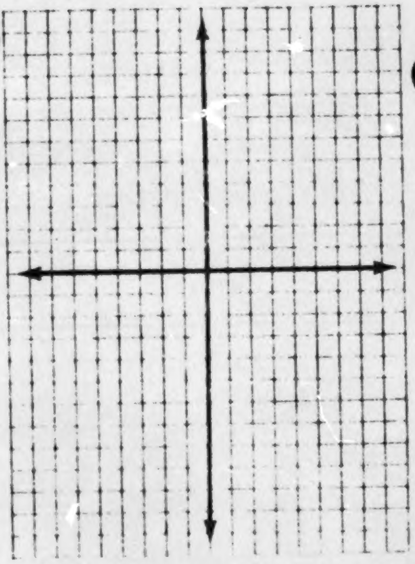

17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
-13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
-14
-15
-16
-17

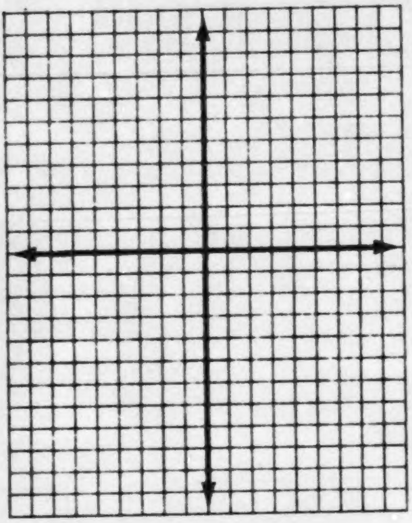

8
7
6
5
4
3
2
1
-13 -12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
-1
-2
-3
-4
-5
-6
-7

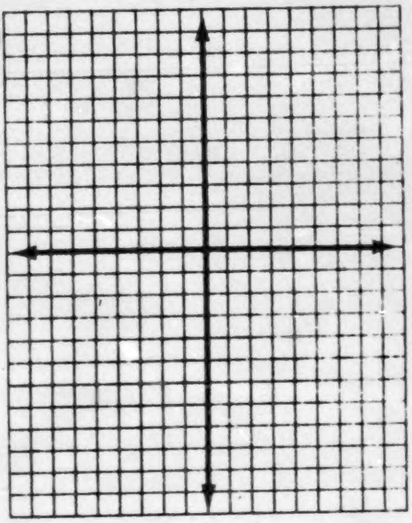

8
7
6
5
4
3
2
1
-12 -11 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
-1
-2
-3
-4
-5
-6
-7

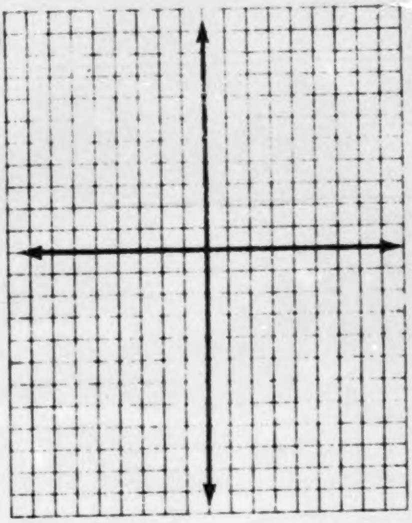
1


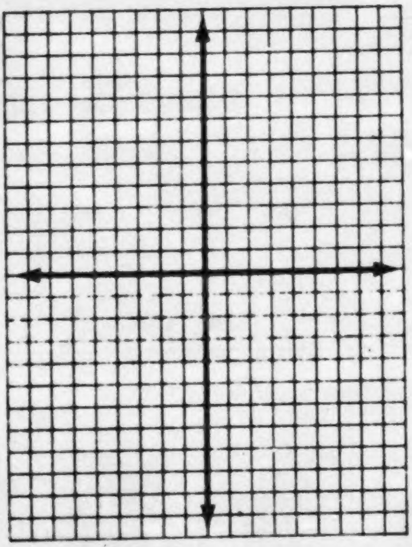
2


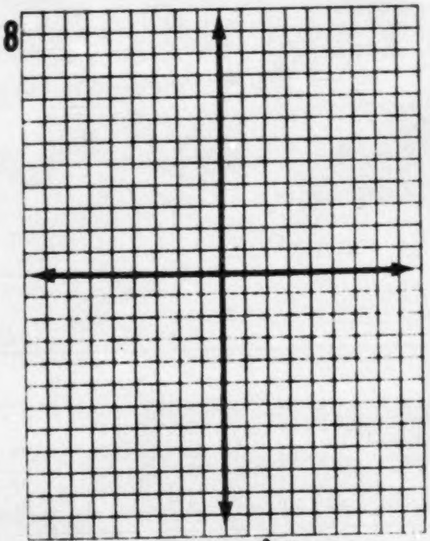
3


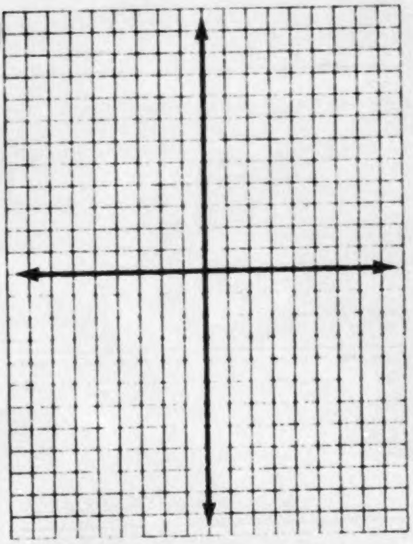
4


5


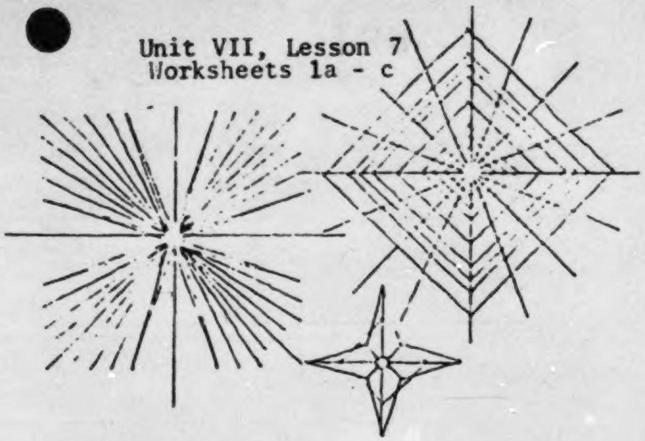
6


7


8


9


Unit VII, Lesson 7
Worksheets 1a - c



125

6. Looking at graphs

1. LINEAR RELATIONS

1.1 Graphs of simple linear relations

Investigation 1

On a sheet of graph paper draw two axes so that the origin is roughly in the middle of the paper (see Figure 1 opposite).

(*a*) Find and plot three points which satisfy the relation $y = x$; for example, (1, 1), (3, 3), ($^-3$, $^-3$). Draw the line with equation $y = x$.

(*b*) On the same diagram, draw the lines $y = x+1$, $y = x+2$, $y = x+3$, $y = x+4$, and label these lines with their equations.

(*c*) What do you notice about these lines?

(*d*) Still on the same diagram, draw the lines $y = x-1$, $y = x-2$, $y = x-3$, $y = x-4$.
What do you notice about these lines?

(*e*) You should now be able to draw the following lines straight away:

(i) $y = x+5$; (ii) $y = x+6$;
(iii) $y = x-5$; (iv) $y = x-7$.

(Do not forget to label all lines you draw with their equations.)

All the lines you have drawn are of the form $y = x+c$.
What does the value of c tell you about the graph?

From The School Mathematics Project, Book D, Cuisenaire Co. of America, 1975, pp. 76- 81.

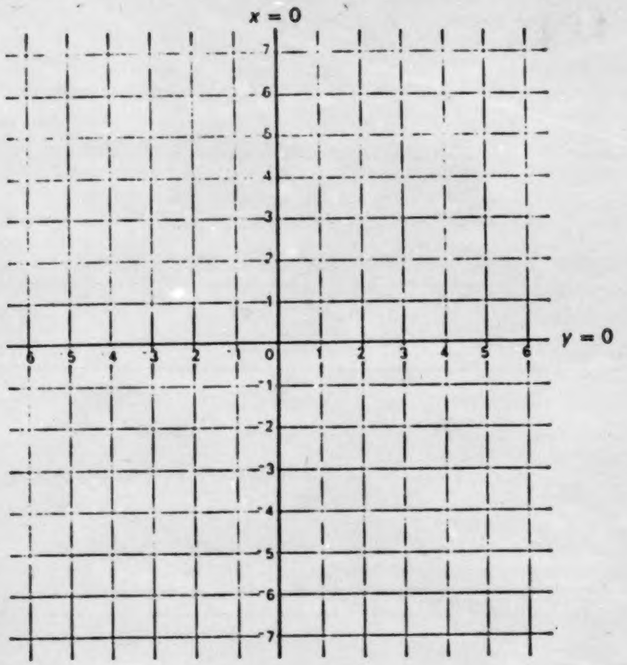


Fig. 1

Investigation 2

Draw two axes on graph paper as you did for Investigation 1.

(*a*) Find three points satisfying $y = {^-x}$; for example, (2, $^-2$), (4, $^-4$), ($^-3$, 3). Draw the line $y = {^-x}$.

(*b*) Do the same for $y = {^-x}+1$, $y = {^-x}+2$, $y = {^-x}+3$, $y = {^-x}+4$. What do you notice about the lines?

(*c*) Draw the lines $y = {^-x}-1$, $y = {^-x}-2$, $y = {^-x}-3$, $y = {^-x}-4$. What do you notice about these lines?

(*d*) Describe in words where you would draw:

(i) $y = {^-x}+5$; (ii) $y = {^-x}+8$;
(iii) $y = {^-x}-6$; (iv) $y = {^-x}-7$.

How are the lines you have just drawn related to one another?

All these lines are of the form $y = {^-x}+c$.
In what way are they different from the lines you drew in Investigation 1?
What does the value of c tell you?

Investigation 3

Draw two axes on graph paper as you did for Investigations 1 and 2.

Now draw the graphs of

$$y = x,\quad y = 2x,\quad y = 3x,\quad y = 4x,$$

$$y = \tfrac{1}{2}x,\quad y = \tfrac{1}{3}x,\quad y = \tfrac{1}{4}x.$$

What do you notice?

These equations are of the form $y = mx$.

What does the value of m tell you?

Investigation 4

On your diagram for Investigation 3, draw the graphs of

$$y = {}^{-}x,\quad y = {}^{-}2x,\quad y = {}^{-}3x,\quad y = {}^{-}4x,$$

$$y = {}^{-}\tfrac{1}{2}x,\quad y = {}^{-}\tfrac{1}{3}x,\quad y = {}^{-}\tfrac{1}{4}x.$$

What is the connection between the lines $y = 2x$ and $y = {}^{-}2x$?

What is the connection between the lines $y = 3x$ and $y = {}^{-}3x$?

What is the connection between the lines $y = \tfrac{1}{4}x$ and $y = {}^{-}\tfrac{1}{4}x$?

Could you have used the graph of $y = 3x$ to draw the graph of $y = {}^{-}3x$?

1.2 Graphs of other linear relations

So far you have drawn only the graphs of simple relations: those like $y = x + 3$ or $y = 2x$.

Now let us consider how you would draw the graph of a relation like $y = 2x + 3$. You first need to find some ordered pairs (x, y) which satisfy the relation.

If $x = 1$, what is y? $y = (2 \times 1) + 3 = 5$ giving the point $(1, 5)$.

If $x = 2$, what is y? $y = (2 \times 2) + 3 = 4 + 3 = 7$ giving the point $(2, 7)$.

If $x = {}^{-}3$, what is y? $y = (2 \times {}^{-}3) + 3 = {}^{-}6 + 3 = {}^{-}3$ giving the point $({}^{-}3, {}^{-}3)$.

Figure 2 shows the graph of the relation $y = 2x + 3$.

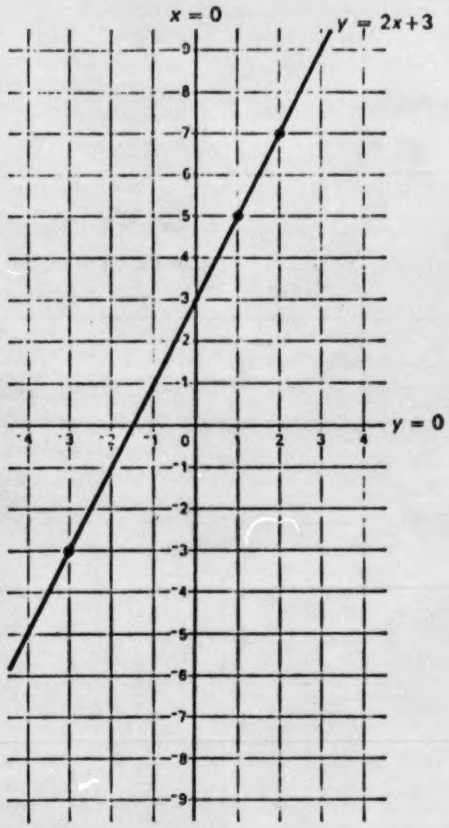


Fig. 2

(*a*) Check first by calculation and then by looking at the graph that the following points satisfy the relation:

$$(0, 3),\quad (3, 9),\quad ({}^{-}1, 1),\quad ({}^{-}2, {}^{-}1).$$

(*b*) Copy Figure 2 onto a sheet of graph paper and on the same sheet, draw the graphs of $y = 2x + 5$, $y = 2x - 1$, $y = 2x - 2$.

What do you notice? Is this what you would have expected?

Exercise A

1 Figure 3 shows the graphs of the relations:

$y = \frac{1}{2}x+3;$
$y = \frac{1}{2}x+1;$
$y = \frac{1}{2}x;$
$y = \frac{1}{2}x-2.$

How are these graphs related to each other?

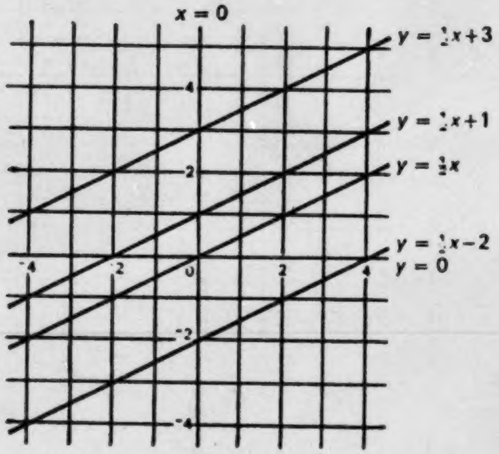


Fig. 3

Copy these lines and on the same diagram draw the graphs of the relations:

$y = ^{-}\frac{1}{2}x+3;$
$y = ^{-}\frac{1}{2}x+1;$
$y = ^{-}\frac{1}{2}x;$
$y = ^{-}\frac{1}{2}x-2.$

How are these graphs related (*a*) to each other; (*b*) to the set of graphs in Figure 3?

2 Figure 4 (opposite) shows the graph of the relation $y = 2x-3$. The dotted lines show how the graph can be used to solve the equation

$$2x-3 = 5,$$

giving $x = 4.$

Use the graph to solve:

(*a*) $2x-3 = 3;$ (*b*) $2x-3 = 7;$ (*c*) $2x-3 = 0;$
(*d*) $2x-3 = {^-}7;$ (*e*) $2x-3 = {^-}2;$ (*f*) $2x-3 = {^-}6.$

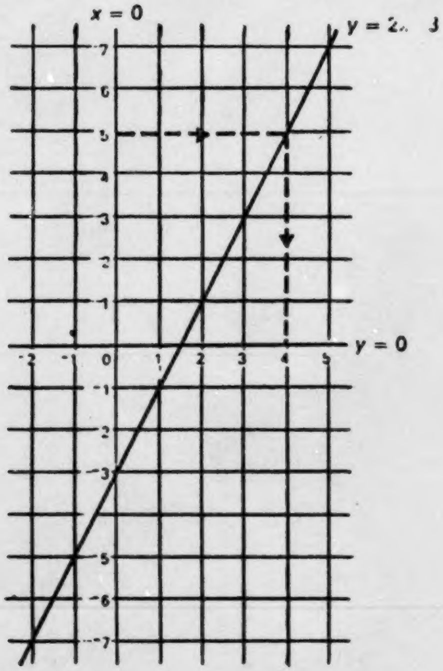


Fig. 4

3 Draw the graph of $y = 3x+2$, choosing values of x between $^-3$ and 2 ($^-3 \leqslant x \leqslant 2$). (You will need to mark your $y = 0$ axis from $^-3$ to 2 and your $x = 0$ axis from $^-7$ to 8.)

Use your graph to solve the equations:

(*a*) $3x+2 = {^-}1;$ (*b*) $3x+2 = 5;$ (*c*) $3x+2 = {^-}7;$
(*d*) $3x+2 = 8;$ (*e*) $3x+2 = 6\frac{1}{2};$ (*f*) $3x+2 = \frac{1}{2}.$

4 Mark out a sheet of graph paper for values of x and y between 0 and 12

Draw the following graphs:

(*a*) $x+y = 4;$ (*b*) $x+y = 6;$
(*c*) $x+y = 7;$ (*d*) $x+y = 10.$

You should now see where to draw the next graphs without doing any working:

(*e*) $x+y = 9;$ (*f*) $x+y = 5;$
(*g*) $x+y = 12;$ (*h*) $x+y = 1.$

Unit VII, Lesson 8

Worksheet 2

TIME YOUR PULSE

How many times does your heart beat in 10 seconds? 20 seconds? 30 seconds? etc? Take your pulse to time your heart beat. To carry out this experiment, you will have to work in teams of two or more students. One student will have to keep track of the time while another counts the pulse. You can feel your pulse on your wrist, or neck, or forehead. If you don't know how to do this, ask your teacher for help.

You will measure your pulse in intervals which are multiples of 10 seconds. If a stop watch is available, use it to determine the time. If a stop watch is not available, use the second hand on your room clock or a watch. Have one person keep track of the time, while another counts the pulse rate. The timer can say "start" and "stop" at the beginning and end of the time period. Since there is some error in our method of measuring pulse rate, it is best to repeat the experiment and take the average of the experiments.

Activity 53

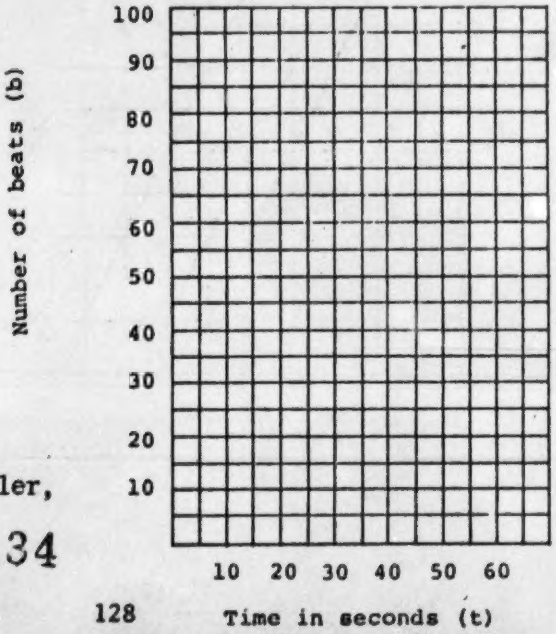
1. Count the number of times your heart beats in 10 seconds. Do this 4 times. Then find the average. (Round off to nearest whole number.)

Exp. 1 ________________ beats
Exp. 2 ________________ beats
Exp. 3 ________________ beats
Exp. 4 ________________ beats
Total Beats ________________
Average ________________ beats per 10 sec.

2. Repeat experiment 1 to determine the number of times your heart beats in 20 seconds.
3. Repeat experiment 1 for 30, 40 and 60 seconds. Complete the following table.

Time in seconds (t)	10	20	30	40	60
Number of beats (b)					

4. Write the ordered pairs (time, beats) from the table (10,), (20,), (30,), (40,), (60,).
5. Graph the ordered pairs (time, beats). Connect the points to complete the graph.
6. From your graph, how many beats go with 50 seconds?
7. About how many seconds go with 25 beats? 40 beats?
8. Tell how you could use this graph and count your heart beat to measure time.



From Laboratory Activities in Algebra by William A. Miller, J. Weston Walch, 1974, pp. 23-24.

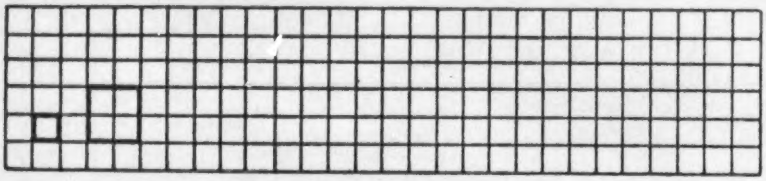
Unit VII, Lesson 8

Worksheet 3

GRAPHING SQUARES

Activity 54

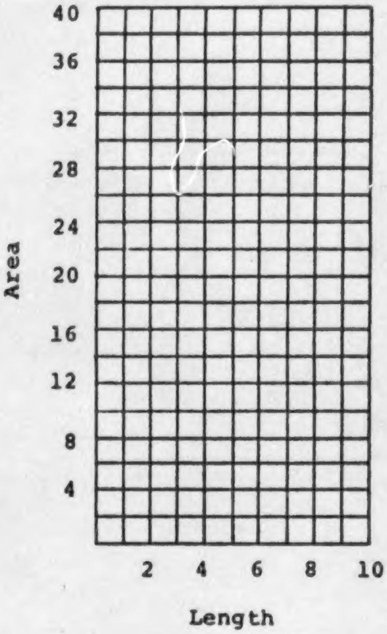
1. Draw squares with sides 1, 2, 3, 4, 5 and 6 units long on the following grid.



2. Find the area of each square by counting the units in each one. Complete the following table.

Length of side (l)	1	2	3	4	5	6
Area (a)	1	4				

3. Write the ordered pairs (length, area) from the table (1,1), (2,4), (3,), (4,), (5,), (6,).
4. Graph the ordered pairs (length, area). Connect the points in a smooth curve to complete your graph.
5. From your graph, what is the area of a square of length 3 1/2? 4 1/2? 5 1/2?



From Laboratory Activities in Algebra by William A. Miller, J. Weston Walch, 1974, pp. 24-25.

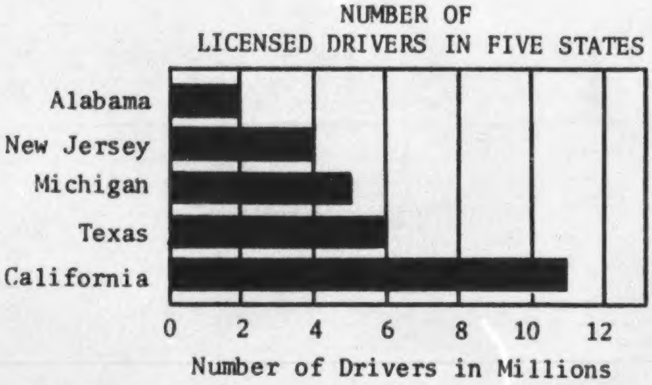
Unit VII

Quiz 1

Name____________________

Date____________________

Place your answers in the spaces provided.



__________ 1. What kind of graph is shown above?

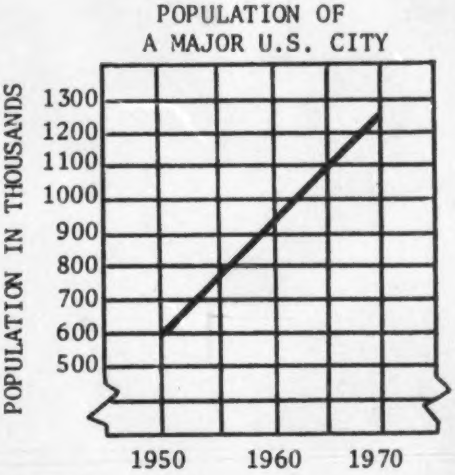
__________ 2. Which of the five states has the fewest licensed drivers? How many?

____

__________ 3. The number of licensed drivers is 5 million in what state?

__________ 4. How many more drivers are licensed in California than in New Jersey?

__________ 5. What is the total number of licensed drivers in the five states listed on the graph?



__________ 6. What kind of graph is shown on the right?

__________ 7. Estimate the population in the year 1955.

__________ 8. The population was about 900,000 in the year _?_.

__________ 9. About what was the increase in population from 1950 to 1965?

__________ 10. Estimate the population of this city in 1980 if it grows at the same rate.

Unit VII

Quiz 2

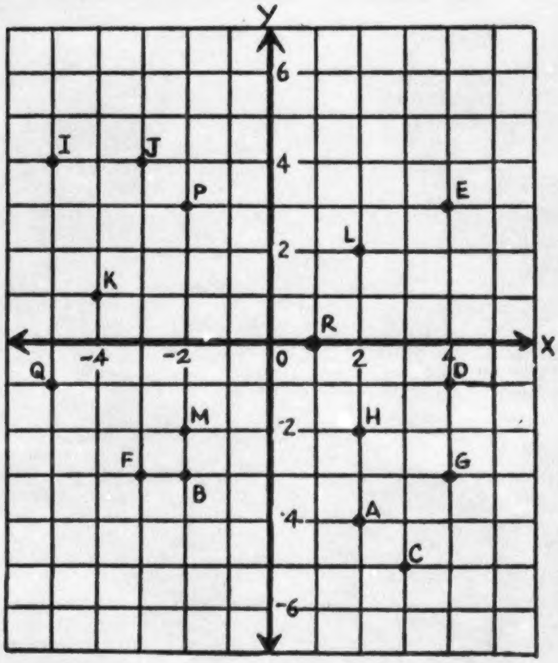
Name ______________________

Date ______________________

1. Give the coordinates of each point

______ a. E ______ c. M

______ b. G ______ d. K



2. Name the point by its letter.

______ a. (1,0) ______ c. $(4,{}^-1)$

______ b. $({}^-2,{}^-3)$ ______ d. $({}^-3,4)$

3. Complete the table:
$y = -2x$

x	y
$^-2$	
$^-1$	
0	
1	

4. Solve the equation for y.

______ a. $x + y = 4$

______ b. $2x - y = 3$

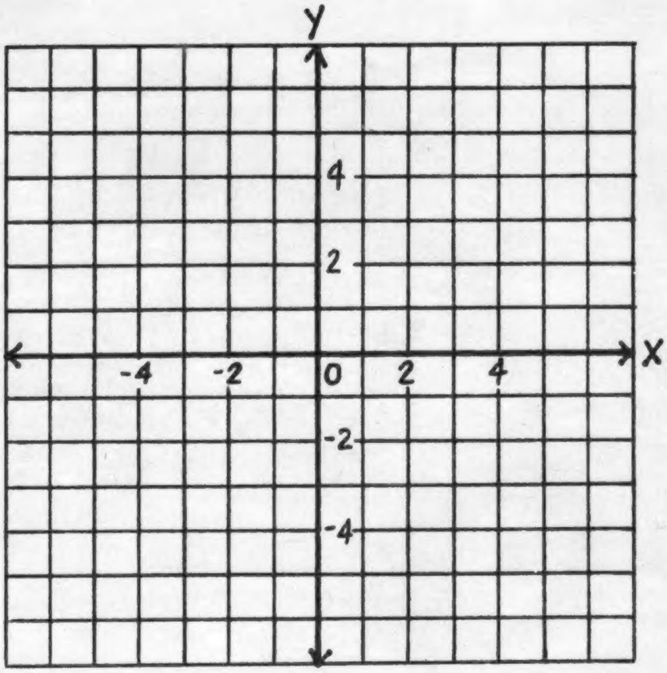
5. Find three solution pairs for the equation: $y - x = 2$

x	y

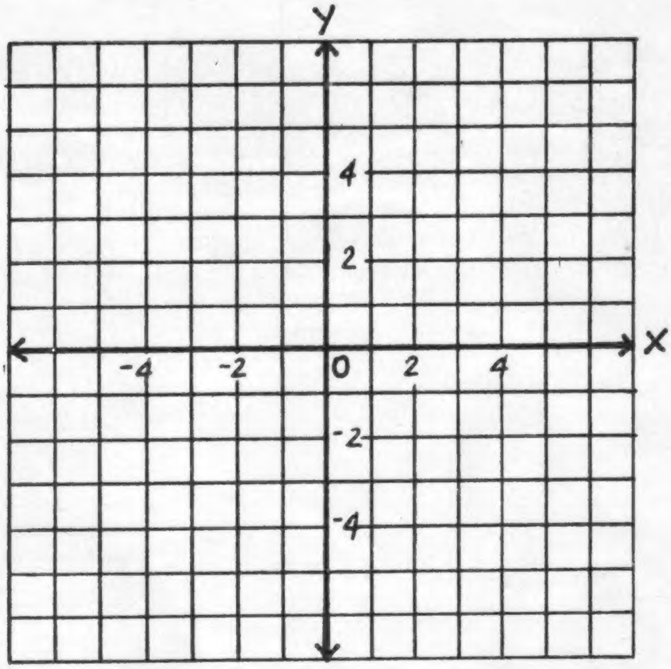
137 (Go on to the next page.)

6. Draw the graph of each equation.

   a. $y = x + 4$

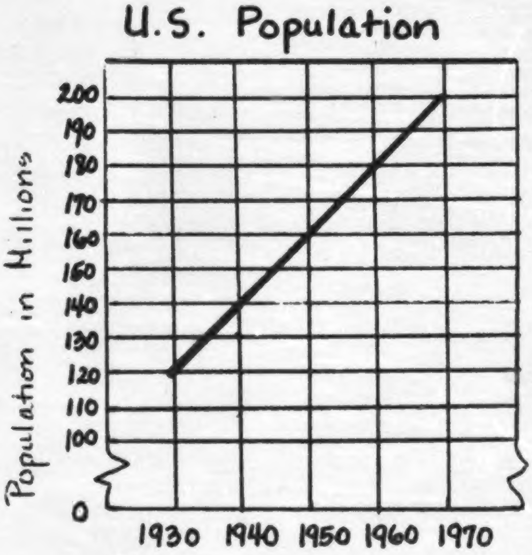


   b. $y = 2x - 3$



Unit VII Test Name______________________________

Show all your written work on these test papers. Place your answers in the spaces provided.



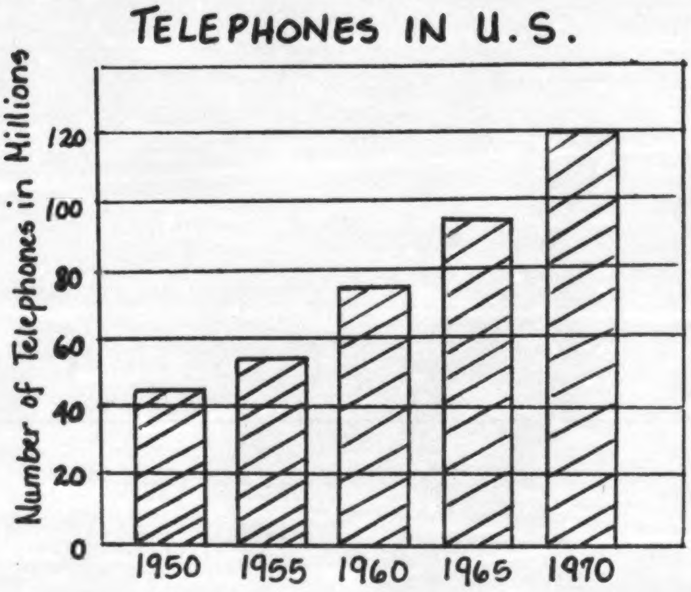
__________ 1. What kind of graph is shown on the right?

__________ 2. Estimate the population in the year 1935.

__________ 3. The population was 160 million in the year ?

__________ 4. About what was the increase in population from 1930 to 1970?

__________ 5. Estimate the population of the United States in 1990 if it grows at the same rate?



__________ 6. What kind of graph is shown above?

__________ 7. In what year were there about 95 million telephones in the U.S.?

__________ 8. Estimate the number of telephones in the U.S. in 1955.

__________ 9. About how many more telephones were there in 1970 than in 1960?

(Go on to the next page.)

Complete the following tables:

10. $y = {}^{-}4x$

x	y
$^{-}2$	
$^{-}1$	
0	
1	

11. $x + y = 9$

x	y
$^{-}2$	
$^{-}1$	
0	
1	

12. $y = 4x + 8$

x	y
$^{-}2$	
$^{-}1$	
0	
1	

13. Give the coordinates of each point.

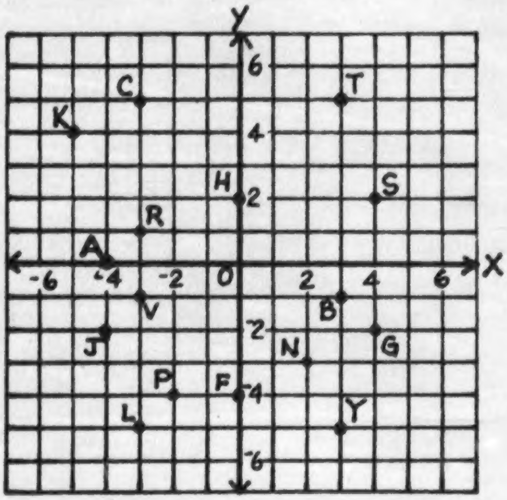
______ a. K ______ c. P

______ b. H ______ d. N

14. Name the point by its letter.

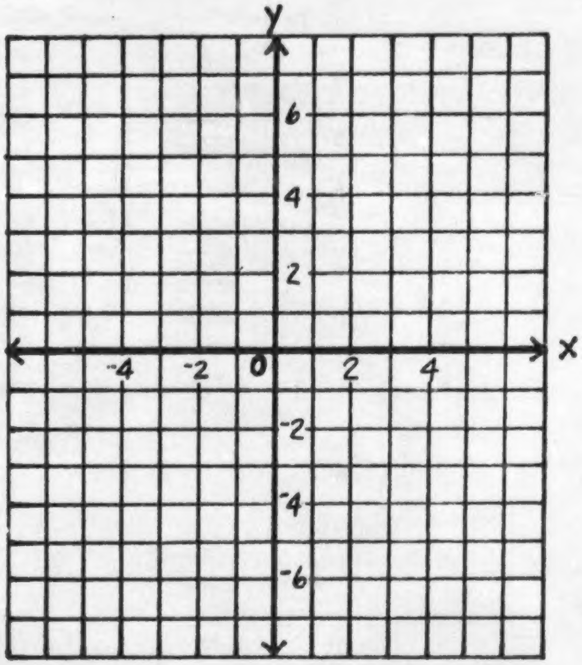
______ a. $(0, {}^{-}4)$ ______ c. $({}^{-}3, 1)$

______ b. $(3, {}^{-}5)$ ______ d. $(4, 2)$



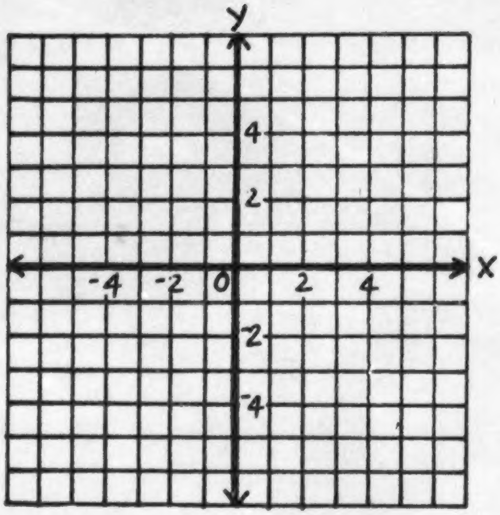
Draw the graph of each equation.

15. $y = x + 2$



(Go on to the next page.)

16. $y = 3x - 2$



ANSWER KEY

Worksheets 1a - c: Looking at graphs

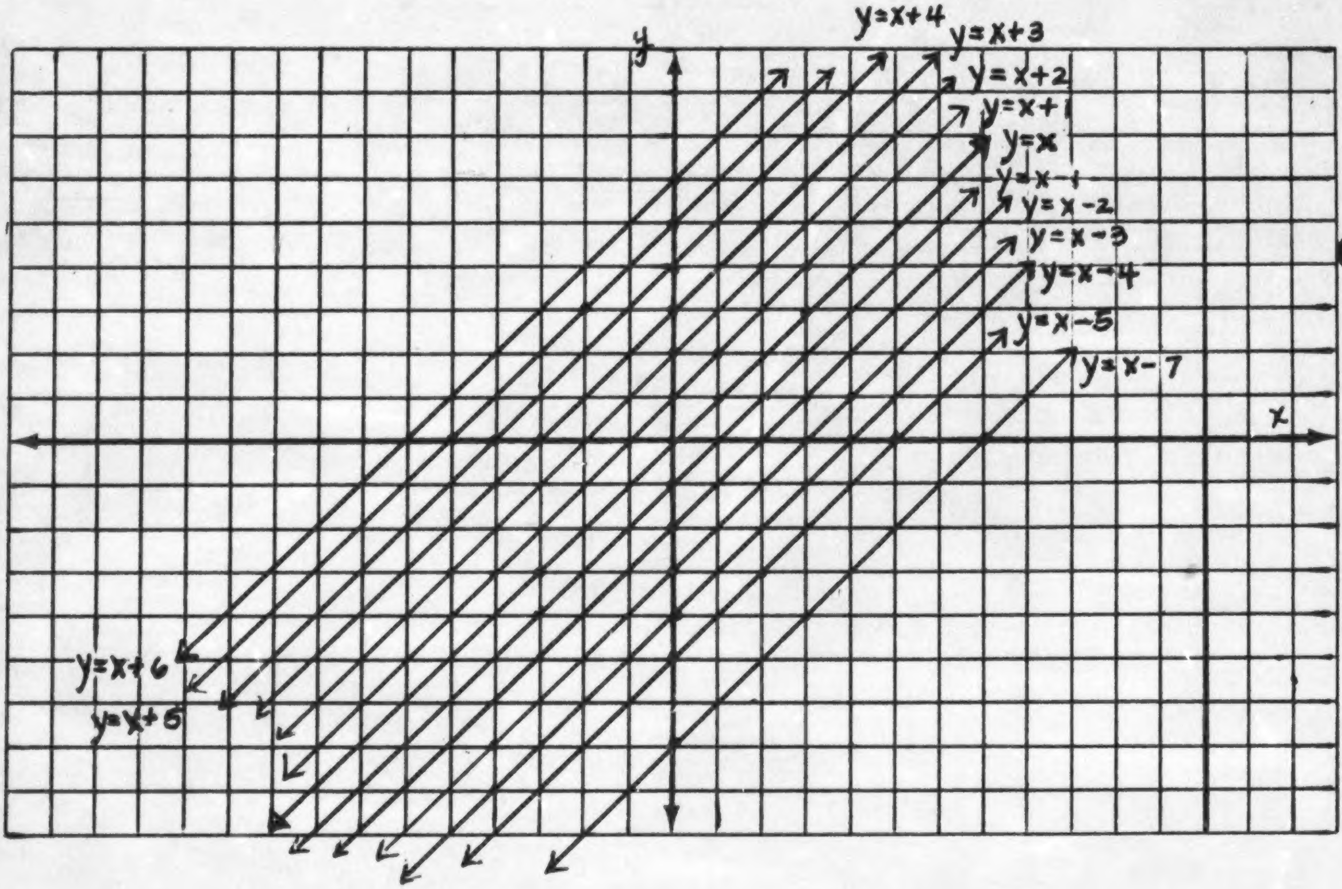
Investigation 1:

(a) & (b) See the graphs below.

(c) The lines are parallel.

(d) See the graphs below. The lines are parallel to the first set and are below the first set.

(e) See the graphs below.
The values of c tell you where the lines cross the y-axis.



(Go on to the next page.)

Investigation 2:

(a) See the graphs below.

(b) See the graphs below. The lines are parallel.

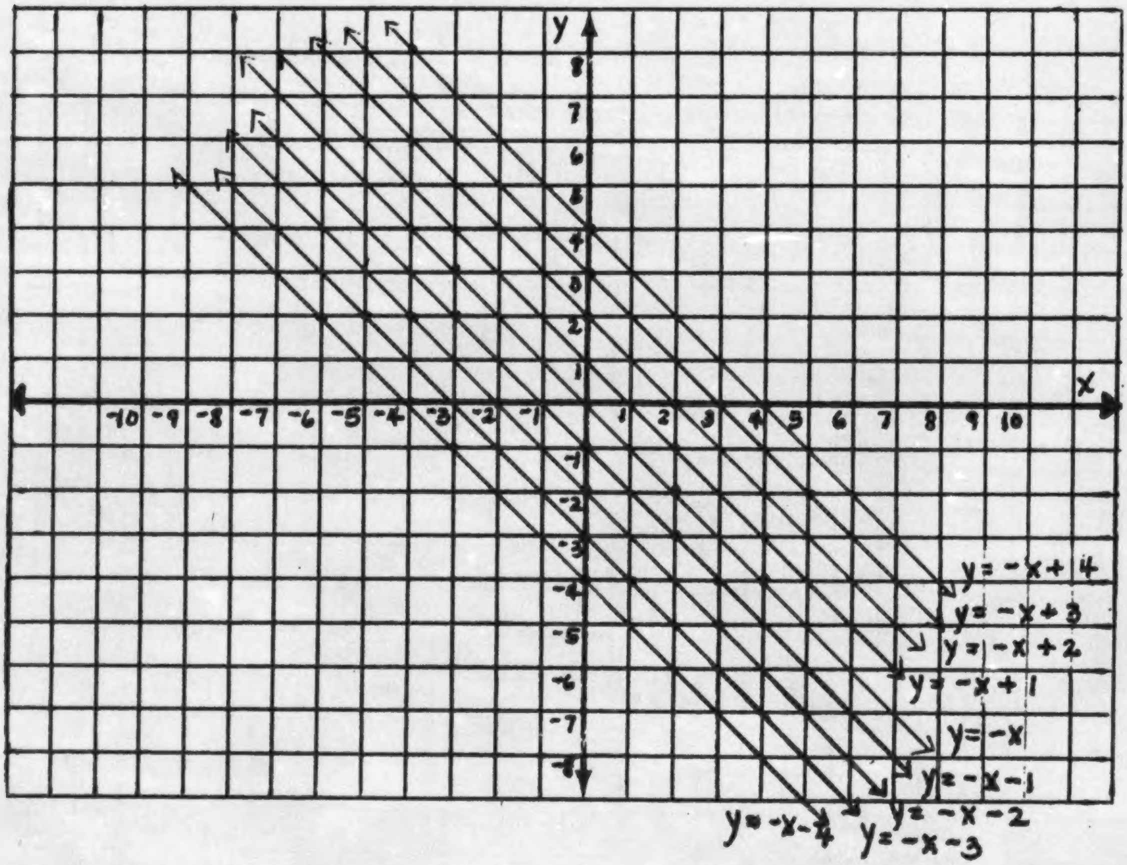
(c) See the graphs below. The lines are all parallel to the first set and are below the first set.

(d) (i) Parallel to the other lines, and crossing the y-axis at 5;
(ii) parallel to the other lines, and crossing the y-axis at 8;
(iii) parallel to the other lines, and crossing the y-axis at $^-6$;
(iv) parallel to the other lines, and crossing the y-axis at $^-7$.

They are parallel to each other.

The lines are the reflections in the y-axis (or x-axis) of the lines drawn in Investigation 1.

The value of c tells you where the lines cross the y-axis.



(Go on to the next page.)

Investigation 3:

See the graphs below.

All lines go through the point, (0, 0).

The value of m tells you how steep the lines are.

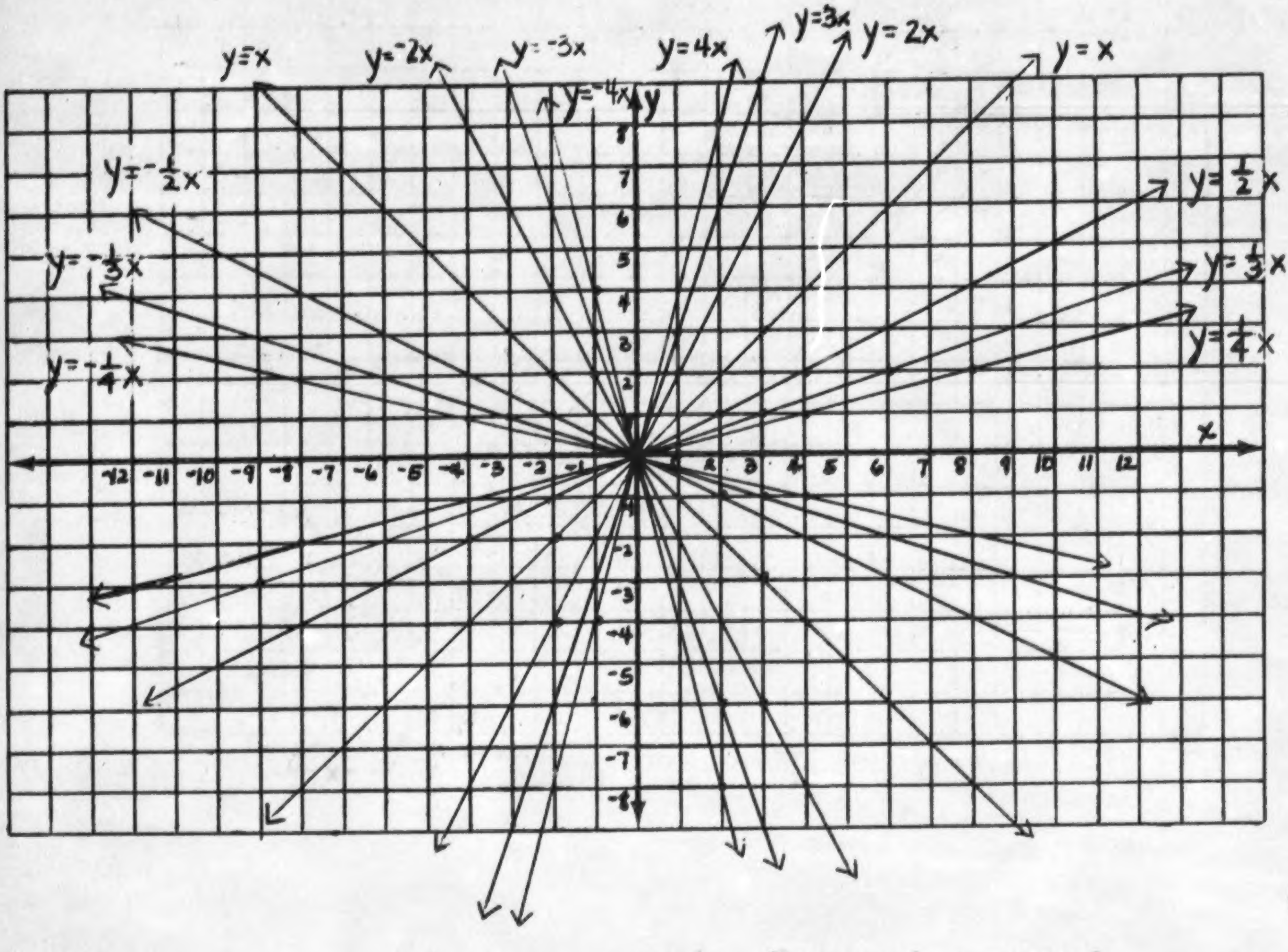
Investigation 4:

See the graphs below.

$y = 2x$ and $y = {}^{-}2x$ are equally steep but slope in directions which are mirror images of each other in the axes; $y = {}^{-}2x$ is the reflection of $y = 2x$ in either the y-axis or the x-axis.

Similar explanations apply for $y = 3x$ and $y = {}^{-}3x$ and for $y = \frac{1}{4}x$ and $y = {}^{-}\frac{1}{4}x$.

If you had already drawn $y = 3x$ you could construct its reflection in either the y-axis or x-axis to give $y = {}^{-}3x$.

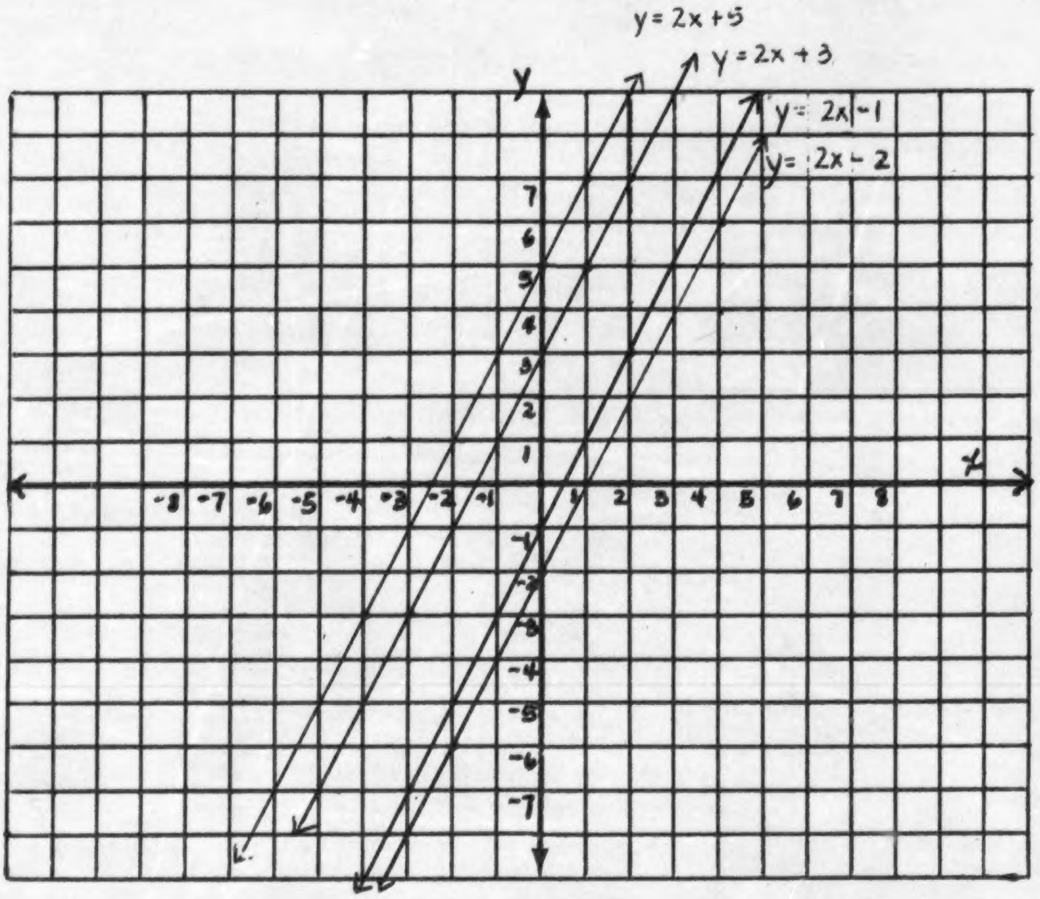


(Go on to the next page.)

1.2 Graphs of other linear relations

(b) See the graphs below.

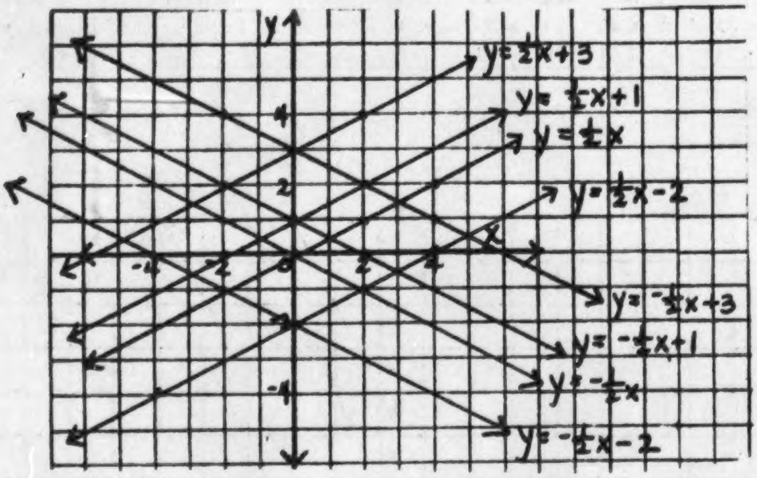
The four lines are parallel. $y = 2x + 3$ cuts the y-axis at 3, $y = 2x + 5$ cuts it at 5, $y = 2x - 1$ cuts it at $^-1$ and $y = 2x - 2$ cuts it at $^-2$.



(Go on to the next page.)

Exercise A

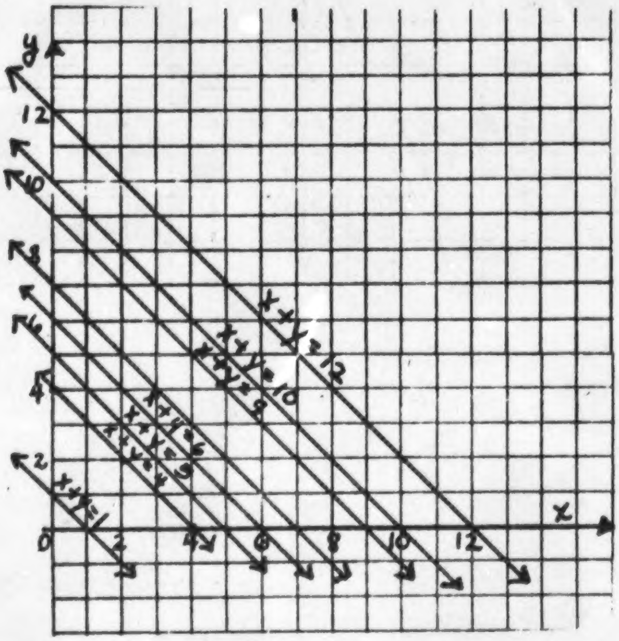
1. The first set of lines are parallel to each other. See the graphs below.
   (a) The second set of lines are parallel to each other.
   (b) They are reflections of the first set in the y-axis (or x-axis).



2. (a) 3 (b) 5 (c) 1½ (d) $^{-}2$ (e) ½ (f) $^{-}1\frac{1}{2}$

3. (a) $^{-}1$ (b) 1 (c) $^{-}3$ (d) 2 (e) 1½ (f) $^{-}\frac{1}{2}$

4. See the graphs below.



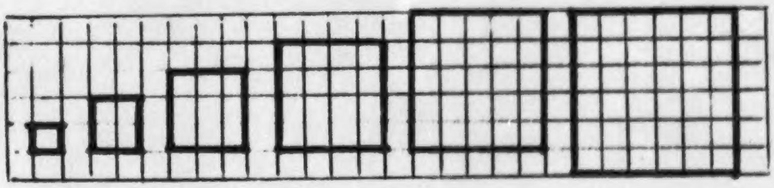
(Go on to the next page.)

Worksheet 2

Answers will vary.

Worksheet 3: Graphing Squares

1.

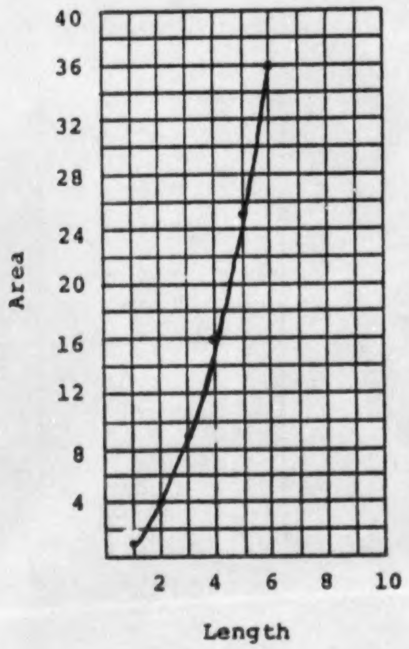


2.

Length of side (ℓ)	1	2	3	4	5	6
Area (a)	1	4	9	16	25	36

3. (1, 1), (2, 4), (3, 9), (4, 16), (5, 25), (6, 36)

4.



5. 12, 20, 30

(Go on to the next page.)

Quiz 1

1. bar graph
2. Alabama; 2 million licensed drivers
3. Michigan
4. 7 million
5. 28 million
6. line graph
7. About 780,000
8. About 1959
9. About 500,000
10. About 1,500,000

Quiz 2

1. a. (4, 3) b. (4, -3) c. (-2, -2) d. (-4, 1)
2. a. R b. B c. D d. J

3.

x	y
-2	4
-1	2
0	0
1	-2

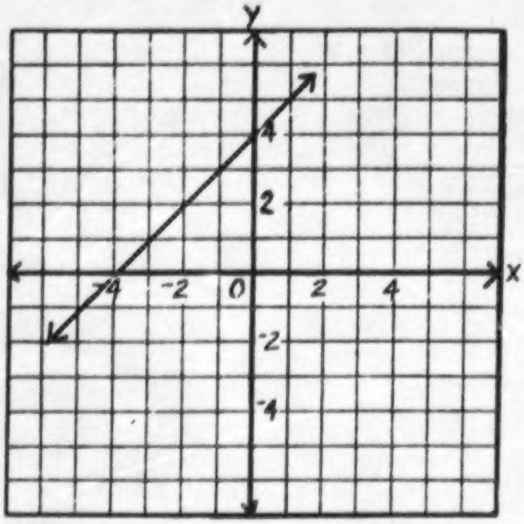
4. a. y = 4 - x

   b. y = 2x - 3

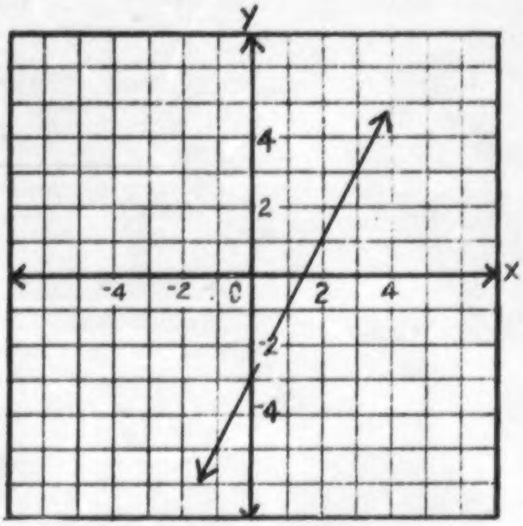
5.

x	y
0	2
-1	1
1	3

6. a.



b.



(Go on to the next page.)

Unit VII Test

1. line graph
2. 130 million
3. 1950
4. 80 million
5. About 240 million
6. bar graph
7. 1965
8. 55 million
9. 45 million

10.

x	y
-2	8
-1	4
0	0
1	-4

11.

x	y
-2	11
-1	10
0	9
1	8

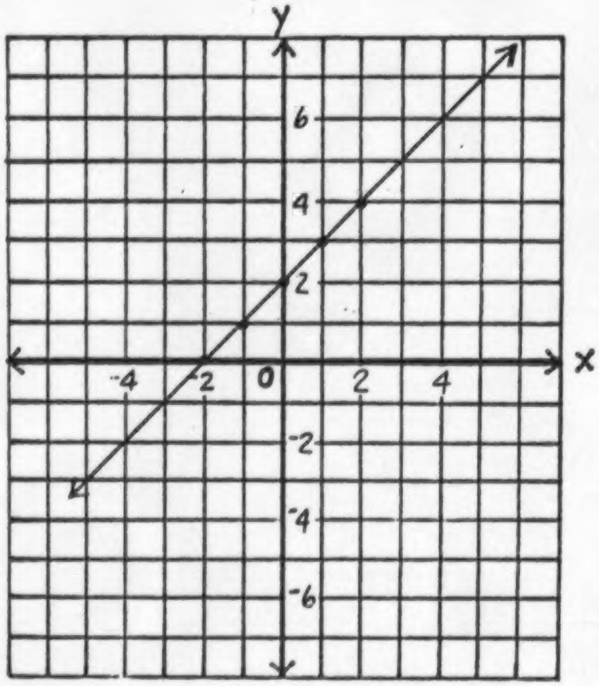
12.

x	y
-2	0
-1	4
0	8
1	12

13. a. (-5, 4) b. (0, 2) c. (-2, -4) d. (2, -3)

14. a. F b. Y c. R d. S

15.



16.